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STORMWATER MANAGEMENT REPORT
for
132 BINGHAM AVENUE

Block 94, Lot 5

Borough of Rumson
Monmouth County, New Jersey

Prepared for Owner/Applicant:
Yellow Brook Property Co., LLC.
247 Bridge Ave., Suite 5
Red Bank, New Jersey 07701



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NJPE License No. 24GE03454800

January 29, 2021
Revised June 18, 2021
FPA No. 15052.003

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1.0 INTRODUCTION

The project is a proposed Residential Development located on an approximately 5.3-acre property known as Block 94, Lot 5, as shown on tax map sheet number 26 of the Borough of Rumson, Monmouth County, New Jersey. The site is currently developed and includes an abandoned Single Family Residential property with overgrown vegetation. The project consists of nine (9) two-story Duplex residential buildings, for a total of 18 Residential dwellings. The project will also include the construction of attached driveways, access roadway, and (2) underground stormwater infiltration basins. The proposed facility will result in a land disturbance of 4.30 acres on site, requiring compliance with the New Jersey Stormwater Management Rules at N.J.A.C. 7:8, and Borough of Rumson stormwater management ordinance. The regulations require that the project must attain a reduction in post development peak runoff rates, provide treatment for stormwater runoff, and meet the pre-development average annual groundwater recharge. The regulations also require incorporating nonstructural stormwater management strategies into the design.

This report contains the drainage, storm sewer, and soil erosion and sediment control calculations required by the municipal, county, and state agencies for their review of the stormwater management plan.

2.0 BASIS OF ENGINEERING ANALYSIS

All stormwater management systems, including collection and conveyance structures, and the recharge, water quality, and detention measures (BMP'S) have been designed in accordance with the provisions of the N.J.A.C. 7:8 – Stormwater Management Rules (NJSMR). The methods outlined in the New Jersey Stormwater Best Management Practices (NJBMP) Manual last updated March 2020 were used to comply with the referenced Rules.

The New Jersey Groundwater Recharge Spreadsheet was used to calculate the post-development annual recharge deficit, and to determine the minimum size and volume of the BMP required to meet the groundwater recharge requirements of the NJSMR. The Soil Survey of Monmouth County, New Jersey, published by Natural Resources Conservation Service, Web Soil Survey was used to obtain the required soil information for the project. A Soils Map of the entire drainage area is included in Appendix A of this report.

Drainage area delineations were based upon the aerial topographic map of the project site supplemented by field reconnaissance and site-specific surveys.

Based upon NRCS NEW JERSEY BULLETIN NO. NJ210-12-1, effective September 10, 2012 New Jersey has two new rainfall distribution regions, Region C and Region D. These new rainfall distributions



replace use of the TYPE III distribution in New Jersey. Monmouth County is within Region D, therefore NOAA-D Distribution and the updated 24-hour rainfall-frequency data for Monmouth County were used to compute the present and proposed condition hydrographs. The latest PondPack Connection Edition Computer Program developed by the Haested Methods was used to generate the runoff hydrographs and hydrologic model for project site. Peak discharges, run-off volumes, and hydrographs were computed for the NJ Water Quality Design Storm, as well as the 2, 10, and 100-year storms. Run-off calculations and precipitation losses were calculated using the NRCS Run-off Curve Numbers (RCNs), based upon the present and proposed watershed conditions. Times of Concentration (TCs) were based upon estimates of overland, shallow concentrated, and open channel flow utilizing methods presented in the National Engineering Handbook, Part 630, Chapter 15. Furthermore, in accordance with the recent guidelines from NRCS the Delmarva Unit Hydrograph was used to model the predevelopment and post development conditions. Pre- and Post-development draining area maps are included in the back pockets of the report.

The proposed storm sewer system was designed using the TR-55 Method with a 25-year frequency (NOAA Rainfall intensity data curves) and a runoff coefficient of 0.99 for impervious surfaces and 0.25 for pervious surfaces for type B soil.

3.0 EXISTING CONDITIONS

The project site is located on Bingham Avenue. The site is currently an abandoned Single Family Residential property with overgrown vegetation. Based on the NRCS web soil survey map for Monmouth County, the soils within the project are Freehold soil (FrkB and FrkC), which has a hydrologic group rating B.

The site has two drainage areas. Drainage area 1, drains in a northerly direction toward the low point and eventually make it way toward the intersection of Ridge Road and Bingham Avenue. Drainage area 2, drains in a southwesterly direction and ponds in an isolated low area in the back yard. The following summary table contains the pre-development peak flow rates from the proposed site:

Table 3.1

	Pre-Development for Drainage Area 1			
Storm Frequency	2-Yr. Storm	10-Yr. Storm	25-Yr. Storm	100-Yr. Storm
Peak Runoff, cfs	2.65	5.50	7.77	12.31



	Pre-Development for Drainage Area 2			
Storm Frequency	2-Yr. Storm	10-Yr. Storm	25-Yr. Storm	100-Yr. Storm
Peak Runoff, cfs	0.81	2.33	3.61	6.24

Detailed computations are included in Appendix C of this report.

4.0 PROPOSED CONDITIONS

The project consists of nine (9) two-story Duplex residential buildings, for a total of 18 Residential dwellings. The project will also include the construction of private driveways, access roadway, and (2) underground stormwater infiltration basins. The proposed facility will result in a land disturbance of 4.28 acres, and an increase in impervious area of 1.38 acres, requiring compliance with the New Jersey Stormwater Management Rules at N.J.A.C. 7:8, and the Borough of Rumson stormwater management ordinance. The following table summarizes the change in pervious and impervious disturbance for the overall project site.

Table 4.1

SUMMARY CHANGE IN PERVERIOUS AND IMPERVIOUS AREA			
Surface Type	Existing Conditions	Proposed Conditions	Change
Pervious	3.22 ac.	1.84 ac.	1.38 ac. decrease
Impervious	1.06 ac.	2.44 ac.	1.38 ac. increase

In the proposed condition, the first underground infiltration basin will collect stormwater runoff from the southwestern portion of the site. The remaining site stormwater runoff will be collected by the second underground infiltration basin. Each basin discharges water to 15" pipes that coalesce at Bingham Avenue then discharge into a proposed 15" pipe toward an existing inlet at the intersection of Bingham Avenue and Ridge Road. The following sections detail the site's compliance with the NJSMR, and the Borough of Rumson stormwater management ordinance.

4.1 Water Quantity

In the proposed condition the site will drain to an underground infiltration basin located in the easterly portion of the site, which in turn will discharge to an Existing inlet. In accordance with NJSMR and Borough's stormwater ordinance, the infiltration basins were designed to reduce the post-development peak runoff rates from the site. The following table summarizes the estimated peak inflows, outflows, and water surface elevations for the underground infiltration basin:



Table 4.2

SUMMARY OF FLOOD ROUTING AT THE PROPOSED UNDERGROUND INFILTRATION BASIN #1			
Storm Frequency (Year)	Peak Inflow (CFS)	Peak Outflow (CFS)	Maximum Water Surface Elevation
2	4.96	0.76	43.64
10	8.61	1.66	44.36
25	11.33	3.10	44.76
100	16.56	6.67	45.47

Table 4.3

SUMMARY OF FLOOD ROUTING AT THE PROPOSED UNDERGROUND INFILTRATION BASIN #2			
Storm Frequency (Year)	Peak Inflow (CFS)	Peak Outflow (CFS)	Maximum Water Surface Elevation
2	3.61	0.19	47.25
10	6.55	0.26	47.88
25	8.78	0.31	48.38
100	13.11	0.41	49.39

The existing site runoff from Pre-Development Drainage Area 2 flows to an isolated low area at the south west portion of the property. In the proposed condition, the drainage area and runoff to this low area will be reduced, not requiring additional detention measures. Table 4.4 below presents a comparison of existing runoff from Drainage Area 1 and the overall proposed site runoff:

Table 4.4

COMPARISON OF PRESENT VERSUS PROPOSED PEAK RUNOFF RATES FROM THE PROJECT SITE (Pre-Development Drainage Area 1 Runoff Only)				
Storm Frequency (Year)	Pre-Development Peak Runoff Rate (cfs)	Maximum Allowable Post-Development Peak Runoff Rate (cfs)	Post-Development Peak Runoff Rate (cfs)	
2	2.65	$2.65 * 0.5 = 1.33$	0.94	O.K.
10	5.50	$5.50 * 0.75 = 4.13$	1.91	O.K.
25	7.77	N/A	3.38	N/A
100	12.31	$12.31 * 0.8 = 9.85$	7.01	O.K.



Based upon Table 4.4, the proposed outflows meet the required reductions set forth in NJSMR and Borough of Rumson stormwater management ordinance. Detailed computations are included in Appendix D of this report.

4.2 Water Quality

The NJSMR requires that a reduction of 80% in Total Suspended Solids (TSS) must be achieved for all proposed TSS producing surfaces. The New Jersey Water Quality Design Storm of 1.25 inches in 2 hours was utilized to compute the volume of runoff to be treated. The underground infiltration basins are designed to retain and recharge the water quality storm runoff volume from each of their respective drainage areas. Runoff from all TSS producing surface is conveyed to the underground infiltration basins. According to Chapter 9.7 of the NJBMP manual this design will provide the required 80% TSS removal rate as follows:

Storage Volume

The storage beds below the underground infiltration basin outlet structures are required to have sufficient volume to fully contain the Water Quality Design Storm of 1.25-inches in the storage bed without overflow. Post-Development Drainage area 1 produces a water quality runoff volume of 5,558 cubic feet. Post-Development Drainage area 2 produces a water quality runoff volume of 3,606 cubic feet. A 40% void ratio is assumed for the storage beds.

Basin 1 Storage Depth:

Basin Area = 6,954 sf

WQ Runoff Volume = 5,558 cubic feet

Storage Bed Depth = $5558/6954 = 0.80 \text{ ft}$ / 0.40 void ratio = 2 ft or 24 in. of depth

Basin 2 Storage Depth:

Basin Area = 10,304 sf

WQ Runoff Volume = 3,606 cubic feet

Storage Bed Depth = $3606/10304 = 0.35 \text{ ft}$ / 0.40 void ratio = 0.875 ft or 10.5 in. of depth

Drain Time

The storage beds must drain completely within 72 hours of a rain event to provide sufficient storage for the next rain event as well as prevent anaerobic standing water conditions. Based on permeability testing (see Appendix A), the minimum percolation rate encountered within the



area of each of the underground infiltration basins was 1.1 in/hr (half the infiltration rate to be used for drain time). Based on the infiltration rate, the drain time for the water quality storm for each of the basins is as follows:

Basin 1 Drain Time:

Storage Bed Depth = 2 ft or 24 in. of depth

Drain Time = 24 in/0.55 in/hr = 43.63 hr.

Basin 2 Drain Time:

Storage Bed Depth = 0.875 ft or 10.5 in. of depth

Drain Time = 10.5 in/0.55 in/hr = 19.09 hr.

Based on the calculations, the proposed underground infiltration basins will allow for the water quality storm to be drained well within the 72-hour time limit. Detailed computations are included in Appendix E of this report.

4.3 Groundwater Recharge

NJSMR and Township's stormwater ordinance require that the project site must maintain its average annual pre-development groundwater recharge volume after development. Based on the NRCS web soil survey map for Monmouth County, the soils within the project are Freehold soil which has a hydrologic group rating B. Based on the NJ GSR-32 Annual Groundwater Recharge Analysis spreadsheet, the total annual recharge volume based on ground cover under the pre-development condition was calculated to be 183,002 cubic feet. The annual recharge volume based on ground cover under the post-development condition was calculated to be 104,172 cubic, creating a deficit of 79,430 cubic feet.

Based on the NJ GSR-32 Annual Groundwater Recharge Analysis spreadsheet, the total annual recharge volume generated by underground infiltration basins 1 and 2 is 199,182 cubic feet and 129,200 cubic feet respectively, creating a total of 328,382 cubic feet of volume recharged. As a result, an overall annual recharge volume surplus of 249,552 cubic feet is created, satisfying the requirements of the NJSMR.

A copy of the test pit logs and permeability testing as well as groundwater recharge spreadsheets are included in Appendix A and F of this report, respectively.



4.4 Low Impact Development

The Low Impact Development Checklist provided in Appendix A of the New Jersey Stormwater Best Management Practices Manual was utilized to identify nonstructural stormwater management strategies incorporated into proposed project.

As per NJAC 7:8-5.3, Nonstructural stormwater management strategies we offer the following:

1. Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss – **We are providing soil erosion and sediment control measures in accordance with the New Jersey Standards to prevent soil erosion and sediment loss.**
2. Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces –**Impervious surfaces have been minimized to meet the allowable coverages permitted by the township regulations.**
3. Maximize the protection of natural drainage features and vegetation – **Currently, there are no natural drainage features on the project site. Additional landscaping and native plantings are being proposed throughout the project site.**
4. Minimize the decrease in the “time of concentration” from the pre-construction to post construction. “Time of concentration” is defined as the time it takes for runoff to travel from the hydraulically most distant point of the drainage area to the point of interest within a watershed. – **The proposed stormwater management system has been designed to minimize the decrease in the time of concentration. The underground infiltration basins have been designed to detain and control stormwater runoff and slowly discharge from the basin.**
5. Minimize land disturbance including clearing and grading –**Many of the existing trees are proposed to remain on site, along with additional landscaping in open areas. In addition, a soil erosion and sediment control plan has been prepared to control the land disturbance and specify soil erosion measures for this project in accordance with the New Jersey Standards.**
6. Minimize soil compaction – **Light weight equipment shall be utilized throughout the project, where applicable, to minimize soil compaction. The project will also meet the Land Grading standards of the Standards for Soil Erosion and Sediment Control in new Jersey, which has requirement for minimizing soil compaction.**
7. Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers and pesticides – **The landscape design does provide low maintenance landscaping with mostly native vegetation. Also,**



the site contains small amounts of lawn area as there are extensive landscape plantings throughout the project site.

8. Provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas – **open channels are utilized to convey stormwater in lawn area between and behind the proposed residential buildings.**
9. Provide other source controls to prevent or minimize the use or exposure of pollutants at the site in order to prevent or minimize the release of those pollutants into the stormwater runoff. These source controls include, but not limited to:
 - i. Site design features that help to prevent accumulation of trash and debris in drainage system – **We are proposing eco inlet curb pieces, trash receptacles, and outlet structure trash racks to help prevent the accumulation of trash and debris.**
 - ii. Site design features that help to prevent discharge of trash and debris from drainage system – **We are proposing eco inlet curb pieces, providing trash racks on the basin outlet structure, and providing conduit outlet protection at the outfall locations.**
 - iii. Site design features that help to prevent and/or contain spills or other harmful accumulations of pollutants at commercial developments – **The proposed development is a multifamily residential development which will not promote any harmful pollutants.**
 - iv. When establishing vegetation after land disturbance, applying fertilizer in accordance with the requirements established under the Soil Erosion and Sediment Control Act and implementing rules. – **We have provided the fertilizer standards on our plans that are consistent with the Soil Erosion and Sediment Control Act and a soil erosion and sediment control certification will be obtained for the project.**

A copy the checklist is enclosed in Appendix G of this report.

5.0 CONCLUSION

Therefore, the proposed storm water management plan meets the requirements of the NJSMR, and the Borough of Rumson stormwater management ordinance.

APPENDIX A
Supporting Documents

Soil Map—Monmouth County, New Jersey



MAP LEGEND

Area of Interest (AOI)		Spoil Area
Soils		Stony Spot
		Very Stony Spot
		Wet Spot
		Other
		Special Line Features
Special Point Features		
Blowout		Streams and Canals
Borrow Pit		Transportation
Clay Spot		Rails
Closed Depression		Interstate Highways
Gravel Pit		US Routes
Gravelly Spot		Major Roads
Landfill		Local Roads
Lava Flow		Background
Marsh or swamp		Aerial Photography
Mine or Quarry		
Miscellaneous Water		
Perennial Water		
Rock Outcrop		
Saline Spot		
Sandy Spot		
Severely Eroded Spot		
Sinkhole		
Slide or Slip		
Sodic Spot		

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.
Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Monmouth County, New Jersey
Survey Area Date: Version 14, Jun 1, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

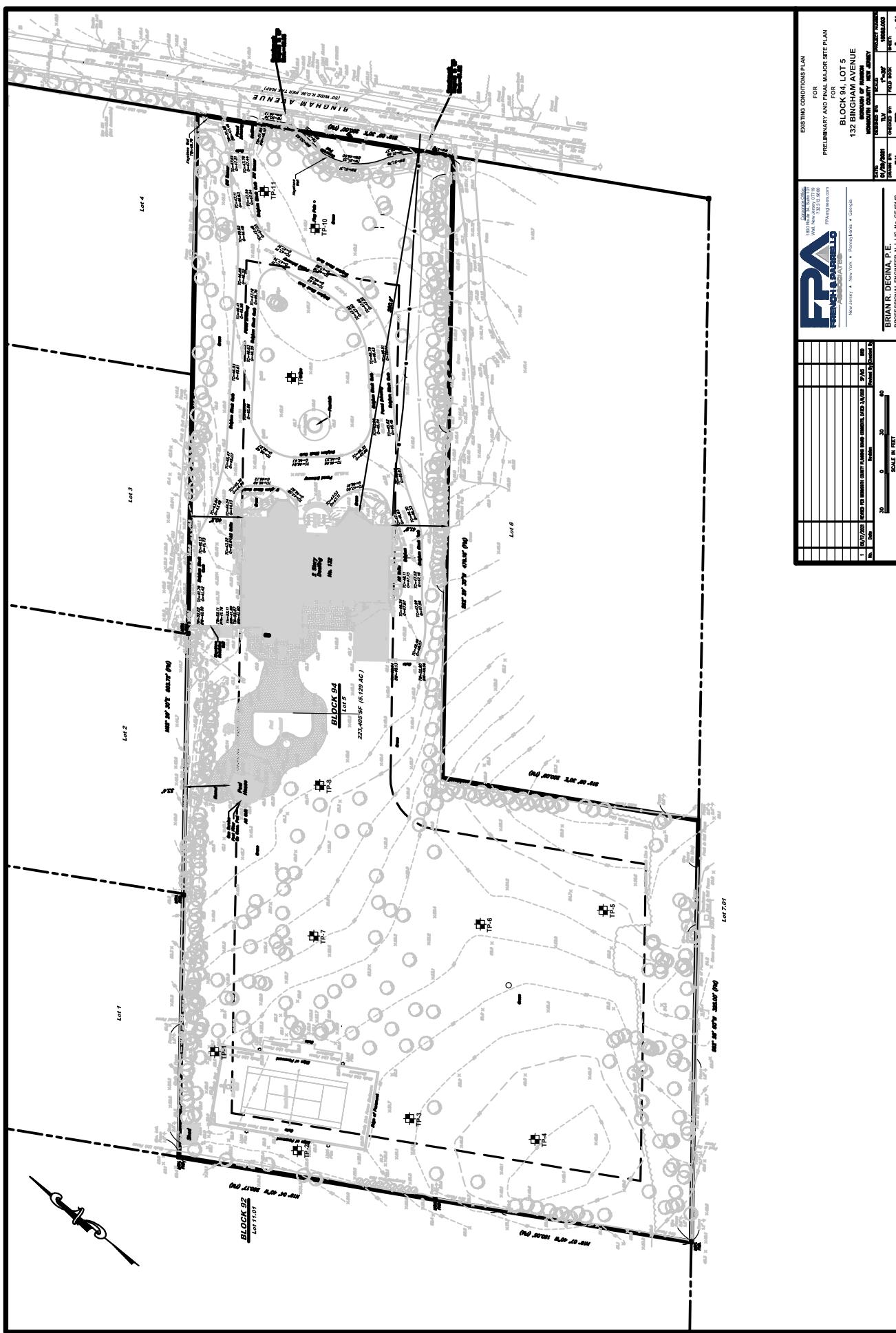
Date(s) aerial images were photographed: Jun 29, 2019–Jul 16, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FrkB	Freehold sandy loam, 2 to 5 percent slopes	1.5	31.0%
FrkC	Freehold sandy loam, 5 to 10 percent slopes	3.4	69.0%
Totals for Area of Interest		5.0	100.0%





DISCLAIMER: This document is provided for informational purposes only. It is not intended as legal advice or a substitute for professional legal counsel. The information contained herein may not reflect the most current developments in the law. You should consult with an attorney for specific legal advice regarding your individual circumstances.

FRENCH & PARRELLO ASSOCIATES, P.A.

1800 State Highway 34, Suite 101
Wall, New Jersey 07719

SOIL LOG

**132 BINGHAM AVE
MAJOR SITE PLAN
BLOCK 94, LOT 5
Borough of Rumson, Monmouth County NJ
(FPA NO. 15052.003)**

SOIL LOG NO.: TP-1

SHEET NO.: 1 OF 11

DATE: 01-14-2021

**GROUND ELEVATION: 52.8
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E**

<u>DEPTH</u>	<u>DESCRIPTION</u>
0" - 6"	Topsoil
6" - 44"	Dark Yellowish Brown (<i>10YR 4/6</i>) Sandy Clay Loam ; subangular blocky, friable
44" - 122"	Yellowish Red (<i>5YR 4/6</i>) Sandy Loam ; crumb, friable

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: / /

Mark Kalusz, EIT

Signature of Professional Engineer: _____ Date: / /

Brian R. Decina, P.E.
N.J.P.E. License No. 45149

FRENCH & PARRELLO ASSOCIATES, P.A.

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SOIL LOG

**132 BINGHAM AVE
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SOIL LOG NO.: TP-2

SHEET NO.: 2 OF 11

DATE: 01-14-2021

GROUND ELEVATION: 52.6

WATER ELEVATION: N/E

DEPTH OF WATER: N/E

ESHWT DEPTH: N/E

ESHWT ELEVATION: N/E

DEPTH

DESCRIPTION

0" - 4" Topsoil

4" - 24" Dark Yellowish Brown (*10YR 4/6*) **Sandy Clay Loam**; subangular blocky, friable

24" - 125" Brownish Yellow (*10YR 6/8*) **Sandy Loam**; crumb, friable

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____

Mark Kalusz, EIT

Date: / /

Signature of Professional Engineer: _____

Brian R. Decina, P.E.
N.J.P.E. License No. 45149

Date: / /

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SOIL LOG

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SOIL LOG NO.: TP-3

SHEET NO.: 3 OF 11

DATE: 01-14-2021

GROUND ELEVATION: 51.1

WATER ELEVATION: N/E

DEPTH OF WATER: N/E

ESHWT DEPTH: N/E

ESHWT ELEVATION: N/E

DEPTH

DESCRIPTION

0" - 8" Topsoil

8" - 39" Dark Yellowish Brown (*10YR 4/6*) **Sandy Clay Loam**; subangular blocky, friable

39" - 88" Brownish Yellow (*10YR 6/8*) **Sandy Loam**; crumb, friable

88" - 125" Yellowish Red (*5YR 4/6*) **Sandy Loam**; crumb, friable

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____

Mark Kalusz, EIT

Date: / /

Signature of Professional Engineer: _____

Brian R. Decina, P.E.
N.J.P.E. License No. 45149

Date: / /

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SOIL LOG

**132 BINGHAM AVE
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(FPA NO. 15052.003)**

SOIL LOG NO.: TP-4

SHEET NO.: 4 OF 11

DATE: 01-14-2021

**GROUND ELEVATION: 49.0
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E**

<u>DEPTH</u>	<u>DESCRIPTION</u>
0" - 8"	Topsoil
8" - 35"	Dark Yellowish Brown (<i>10YR 4/6</i>) Sandy Clay Loam ; subangular blocky, friable
35" - 91"	Brownish Yellow (<i>10YR 6/8</i>) Sandy Loam ; crumb, friable
91" - 126"	Yellowish Red (<i>5YR 4/6</i>) Sandy Loam ; crumb, friable

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____

Mark Kalusz, EIT

Date: / /

Signature of Professional Engineer: _____

Brian R. Decina, P.E.
N.J.P.E. License No. 45149

Date: / /

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SOIL LOG

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SOIL LOG NO.: TP-5

SHEET NO.: 5 OF 11

DATE: 01-14-2021

GROUND ELEVATION: 54.5

WATER ELEVATION: N/E

DEPTH OF WATER: N/E

ESHWT DEPTH: N/E

ESHWT ELEVATION: N/E

DEPTH

DESCRIPTION

0" - 8" Topsoil

8" - 40" Dark Yellowish Brown (*10YR 4/6*) **Sandy Clay Loam**; subangular blocky, friable

40" - 94" Brownish Yellow (*10YR 6/8*) **Sandy Loam**; crumb, friable

94" - 130" Yellowish Red (*5YR 4/6*) **Sandy Loam**; crumb, friable

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____

Mark Kalusz, EIT

Date: / /

Signature of Professional Engineer: _____

Brian R. Decina, P.E.
N.J.P.E. License No. 45149

Date: / /

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SOIL LOG NO.: TP-6

SHEET NO.: 6 OF 11

DATE: 01-14-2021

**GROUND ELEVATION: 53.2
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E**

<u>DEPTH</u>	<u>DESCRIPTION</u>
0" - 6"	Topsoil
6" - 40"	Dark Yellowish Brown (<i>10YR 4/6</i>) Sandy Clay Loam ; subangular blocky, friable
40" - 126"	Yellowish Red (<i>5YR 4/6</i>) Sandy Loam ; crumb, friable

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: / /
Mark Kalusz, EIT

Signature of Professional Engineer: _____ Date: / /
Brian R. Decina, P.E.
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SOIL LOG NO.: TP-7

SHEET NO.: 7 OF 11

DATE: 01-14-2021

GROUND ELEVATION: 51.8

WATER ELEVATION: N/E

DEPTH OF WATER: N/E

ESHWT DEPTH: N/E

ESHWT ELEVATION: N/E

DEPTH

DESCRIPTION

0" - 6" Topsoil

6" - 55" Dark Yellowish Brown (*10YR 4/6*) **Sandy Clay Loam**; subangular blocky, friable

55" - 128" Yellowish Red (*5YR 4/6*) **Sandy Loam**; crumb, friable

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____

Mark Kalusz, EIT

Date: / /

Signature of Professional Engineer: _____

Brian R. Decina, P.E.
N.J.P.E. License No. 45149

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SOIL LOG NO.: TP-8

SHEET NO.: 8 OF 11

DATE: 01-14-2021

**GROUND ELEVATION: 49.0
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E**

<u>DEPTH</u>	<u>DESCRIPTION</u>
0" - 6"	Topsoil
6" - 39"	Dark Yellowish Brown (<i>10YR 4/6</i>) Sandy Clay Loam ; subangular blocky, friable
39" - 130"	Yellowish Red (<i>5YR 4/6</i>) Sandy Loam ; crumb, friable

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____ Date: / /
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Signature of Professional Engineer: _____ Date: / /
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SOIL LOG

**132 BINGHAM AVE
MAJOR SITE PLAN
BLOCK 94, LOT 5
Borough of Rumson, Monmouth County NJ
(FPA NO. 15052.003)**

SOIL LOG NO.: TP-9

SHEET NO.: 9 OF 11

DATE: 01-14-2021

GROUND ELEVATION: 46.7

WATER ELEVATION: N/E

DEPTH OF WATER: N/E

ESHWT DEPTH: N/E

ESHWT ELEVATION: N/E

DEPTH

DESCRIPTION

0" - 6" Topsoil

6" - 25" Very Dark Grayish Brown (*10YR 3/2*) **Sandy Clay Loam**; subangular blocky, friable

25" - 52" Dark Yellowish Brown (*10YR 4/6*) **Sandy Clay Loam**; subangular blocky, friable

52" - 100" Brownish Yellow (*10YR 6/8*) **Sandy Loam**; crumb, friable

100" - 130" Yellowish Red (*5YR 4/6*) **Sandy Loam**; crumb, friable

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____

Mark Kalusz, EIT

Date: / /

Signature of Professional Engineer: _____

Brian R. Decina, P.E.
N.J.P.E. License No. 45149

Date: / /

FRENCH & PARRELLO ASSOCIATES, P.A.

1800 State Highway 34, Suite 101
Wall, New Jersey 07719

SOIL LOG

**132 BINGHAM AVE
MAJOR SITE PLAN
BLOCK 94, LOT 5
Borough of Rumson, Monmouth County NJ
(FPA NO. 15052.003)**

SOIL LOG NO.: TP-10

SHEET NO.: 10 OF 11

DATE: 01-14-2021

**GROUND ELEVATION: 48.1
WATER ELEVATION: N/E
DEPTH OF WATER: N/E
ESHWT DEPTH: N/E
ESHWT ELEVATION: N/E**

<u>DEPTH</u>	<u>DESCRIPTION</u>
0" - 6"	Topsoil
6" - 29"	Very Dark Grayish Brown (<i>10YR 3/2</i>) Sandy Clay Loam ; subangular blocky, friable
29" - 45"	Dark Yellowish Brown (<i>10YR 4/6</i>) Sandy Clay Loam ; subangular blocky, friable
45" - 110"	Brownish Yellow (<i>10YR 6/8</i>) Sandy Loam ; crumb, friable
110" - 125"	Yellowish Red (<i>5YR 4/6</i>) Sandy Loam ; crumb, friable

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____

Mark Kalusz, EIT

Date: / /

Signature of Professional Engineer: _____

Brian R. Decina, P.E.
N.J.P.E. License No. 45149

Date: / /

FRENCH & PARRELLO ASSOCIATES, P.A.

1800 State Highway 34, Suite 101
Wall, New Jersey 07719

SOIL LOG

**132 BINGHAM AVE
MAJOR SITE PLAN
BLOCK 94, LOT 5
Borough of Rumson, Monmouth County NJ
(FPA NO. 15052.003)**

SOIL LOG NO.: TP-11

SHEET NO.: 11 OF 11

DATE: 01-14-2021

GROUND ELEVATION: 47.7

WATER ELEVATION: N/E

DEPTH OF WATER: N/E

ESHWT DEPTH: N/E

ESHWT ELEVATION: N/E

DEPTH

DESCRIPTION

0" - 6" Topsoil

6" - 28" Very Dark Grayish Brown (*10YR 3/2*) **Sandy Clay Loam**; subangular blocky, friable

28" - 40" Dark Yellowish Brown (*10YR 4/6*) **Sandy Clay Loam**; subangular blocky, friable

40" - 70" Brownish Yellow (*10YR 6/8*) **Sandy Loam**; crumb, friable

70" - 125" Yellowish Red (*5YR 4/6*) **Sandy Loam**; crumb, friable

END OF SOIL LOG

Notes:

Signature of Soil Evaluator: _____

Mark Kalusz, EIT

Date: / /

Signature of Professional Engineer: _____

Brian R. Decina, P.E.
N.J.P.E. License No. 45149

Date: / /

COUNTY/MUNICIPALITY MONMOUTH / BOROUGH OF RUMSON

Percolation Test Data:

Block 94 Lot 5

1. Test Number TP-1 Replicate (Letter) _____ Date Tested _____
2. Depth 36 " below grade
3. Pre-soak:
 Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes 90
_____ Four Hour Pre-soak completed - Indicate result:
_____ Test Hole Drained within 15 to 24 hours after Pre-soak
_____ Test Hole did not Drain within 24 hours after Pre-soak
4. Rate of Fall Data:
 - a. Time Interval Selected, Minutes 3
 - b. Record the Drop in Water Level during each time interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
<u>13 "</u>	<u>12.5 "</u>	<u>0.5 "</u>
<u>12.5 "</u>	<u>12 "</u>	<u>0.5 "</u>
<u>12 "</u>	<u>11.75 "</u>	<u>0.25 "</u>
5. Percolation Rate:
 - a. Time, minutes, Required for a Six-inch Drop in the Water level 60 min
 - b. Percolation Rate = $a/6 = 60 / 6 = 10$ min/in
6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)
 $K = a/pm$ (in/hr) where $a = 22$ for a bottom width of 8 inches
 $K = 22 / 10$ min/in. = 2.2 in/hr; 2.2 / 2 = 1.1 in/hr Therefore, Use 1.1 in/hr
7. I hereby certify that the information furnished on Form 3d of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator _____

Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Brian R. Decina, PE, CME

License No. _____

COUNTY/MUNICIPALITY MONMOUTH / BOROUGH OF RUMSON

Percolation Test Data:

Block 94 Lot 5

1. Test Number TP-2 Replicate (Letter) _____ Date Tested _____
2. Depth 24 " **below grade**
3. Pre-soak:
 Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes 5
 Four Hour Pre-soak completed - Indicate result:
 Test Hole Drained within 15 to 24 hours after Pre-soak
 Test Hole did not Drain within 24 hours after Pre-soak
4. Rate of Fall Data:
 - a. Time Interval Selected, Minutes 3
 - b. Record the Drop in Water Level during each time interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
<u>13</u> "	<u>11</u> "	<u>2</u> "
<u>11</u> "	<u>9</u> "	<u>2</u> "
<u>9</u> "	<u>8.5</u> "	<u>1.5</u> "
5. Percolation Rate:
 - a. Time, minutes, Required for a Six-inch Drop in the Water level 6 min
 - b. Percolation Rate = $a/6 = \frac{6}{6} = 1$ min/in
6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)
 $K = a/pm$ (in/hr) where $a = 22$ for a bottom width of 8 inches
 $K = 22/\underline{1}$ min/in. = 22 in/ hr; 22 /2 = 11 in/hr Therefore, Use 11 in/hr
7. I hereby certify that the information furnished on Form 3d of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator _____

Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Brian R. Decina, PE, CME

License No. _____

COUNTY/MUNICIPALITY MONMOUTH / BOROUGH OF RUMSON

Percolation Test Data:

Block 94 Lot 5

1. Test Number TP-10 Replicate (Letter) _____ Date Tested _____
2. Depth 45 " below grade
3. Pre-soak:
 Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes 8
_____ Four Hour Pre-soak completed - Indicate result:
_____ Test Hole Drained within 15 to 24 hours after Pre-soak
_____ Test Hole did not Drain within 24 hours after Pre-soak
4. Rate of Fall Data:
 - a. Time Interval Selected, Minutes 1
 - b. Record the Drop in Water Level during each time interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
<u>13</u> "	<u>11</u> "	<u>2</u> "
<u>11</u> "	<u>9.5</u> "	<u>1</u> "
<u>9.5</u> "	<u>8.5</u> "	<u>1.5</u> "
5. Percolation Rate:
 - a. Time, minutes, Required for a Six-inch Drop in the Water level 60 min
 - b. Percolation Rate = $a/6 = \frac{60}{6} = 10$ min/in
6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)
 $K = a/pm$ (in/hr) where $a = 22$ for a bottom width of 8 inches
 $K = 22/\underline{10}$ min/in. = 2.2 in/hr; 2.2 /2 = 1.1 in/hr Therefore, Use 1.1 in/hr
7. I hereby certify that the information furnished on Form 3d of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator _____

Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Brian R. Decina, PE, CME

License No. _____

COUNTY/MUNICIPALITY MONMOUTH / BOROUGH OF RUMSON

Percolation Test Data:

Block 94 Lot 5

1. Test Number TP-11 Replicate (Letter) _____ Date Tested _____
2. Depth 24 " **below grade**
3. Pre-soak:
 Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required for 12 in. of Water to Drain after Second Filling, Minutes 20
_____ Four Hour Pre-soak completed - Indicate result:
_____ Test Hole Drained within 15 to 24 hours after Pre-soak
_____ Test Hole did not Drain within 24 hours after Pre-soak
4. Rate of Fall Data:
 - a. Time Interval Selected, Minutes 3
 - b. Record the Drop in Water Level during each time interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
<u>13</u> "	<u>11</u> "	<u>2</u> "
<u>11</u> "	<u>9.5</u> "	<u>1.5</u> "
<u>9.5</u> "	<u>8.5</u> "	<u>1.5</u> "
5. Percolation Rate:
 - a. Time, minutes, Required for a Six-inch Drop in the Water level 6 min
 - b. Percolation Rate = $a/6 = \frac{6}{6} = 1$ min/in
6. Per NJ Stormwater Best Management Practices Manual, Appendix E Section B1(e.)
 $K = a/pm$ (in/hr) where $a = 22$ for a bottom width of 8 inches
 $K = 22/\underline{1.67}$ min/in. = 13.2 in/hr; 13.2/2 = 6.6 in/hr Therefore, Use 6.6 in/hr
7. I hereby certify that the information furnished on Form 3d of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator _____

Mark Kalusz, EIT

Date _____

Signature of Professional Engineer _____

Brian R. Decina, PE, CME

License No. _____



NOAA Atlas 14, Volume 2, Version 3
Location name: Rumson, New Jersey, USA*
Latitude: 40.3621°, Longitude: -73.9965°
Elevation: 19.9 ft**

* source: ESRI Maps
** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps & aerials](#)

PF tabular

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.10 (3.72-4.54)	4.91 (4.44-5.42)	5.81 (5.26-6.43)	6.48 (5.86-7.16)	7.31 (6.56-8.09)	7.91 (7.07-8.74)	8.56 (7.60-9.48)	9.12 (8.04-10.1)	9.85 (8.57-11.0)	10.4 (8.98-11.7)
10-min	3.27 (2.96-3.62)	3.92 (3.55-4.33)	4.64 (4.21-5.14)	5.18 (4.69-5.74)	5.83 (5.24-6.45)	6.31 (5.63-6.97)	6.77 (6.01-7.51)	7.21 (6.35-8.00)	7.76 (6.76-8.68)	8.17 (7.04-9.18)
15-min	2.73 (2.47-3.02)	3.28 (2.97-3.63)	3.91 (3.54-4.33)	4.36 (3.94-4.82)	4.91 (4.41-5.43)	5.32 (4.75-5.88)	5.70 (5.06-6.32)	6.06 (5.34-6.73)	6.51 (5.66-7.28)	6.83 (5.89-7.67)
30-min	1.87 (1.69-2.07)	2.27 (2.05-2.50)	2.78 (2.52-3.08)	3.16 (2.85-3.49)	3.64 (3.27-4.02)	3.99 (3.56-4.41)	4.35 (3.87-4.82)	4.70 (4.14-5.22)	5.16 (4.49-5.77)	5.51 (4.75-6.19)
60-min	1.16 (1.05-1.29)	1.42 (1.29-1.57)	1.78 (1.61-1.97)	2.05 (1.85-2.27)	2.42 (2.17-2.67)	2.70 (2.41-2.99)	2.99 (2.66-3.32)	3.29 (2.90-3.66)	3.70 (3.22-4.13)	4.02 (3.46-4.51)
2-hr	0.721 (0.649-0.800)	0.880 (0.793-0.977)	1.11 (1.00-1.24)	1.29 (1.16-1.43)	1.54 (1.38-1.71)	1.74 (1.55-1.94)	1.96 (1.72-2.17)	2.17 (1.90-2.42)	2.48 (2.14-2.78)	2.73 (2.33-3.08)
3-hr	0.531 (0.480-0.590)	0.649 (0.587-0.721)	0.821 (0.742-0.914)	0.956 (0.861-1.06)	1.15 (1.02-1.27)	1.30 (1.15-1.45)	1.46 (1.29-1.63)	1.63 (1.42-1.82)	1.87 (1.61-2.10)	2.07 (1.76-2.33)
6-hr	0.340 (0.306-0.378)	0.412 (0.373-0.459)	0.520 (0.469-0.578)	0.607 (0.545-0.673)	0.731 (0.650-0.809)	0.834 (0.737-0.924)	0.943 (0.825-1.05)	1.06 (0.918-1.18)	1.23 (1.05-1.37)	1.37 (1.15-1.53)
12-hr	0.206 (0.186-0.228)	0.250 (0.226-0.277)	0.316 (0.285-0.351)	0.372 (0.334-0.411)	0.453 (0.403-0.501)	0.522 (0.461-0.577)	0.598 (0.521-0.661)	0.680 (0.585-0.754)	0.801 (0.677-0.892)	0.905 (0.752-1.01)
24-hr	0.117 (0.107-0.128)	0.142 (0.130-0.156)	0.183 (0.168-0.201)	0.219 (0.200-0.239)	0.272 (0.247-0.296)	0.318 (0.286-0.346)	0.370 (0.330-0.402)	0.429 (0.378-0.465)	0.517 (0.449-0.561)	0.594 (0.508-0.646)
2-day	0.069 (0.063-0.077)	0.084 (0.077-0.093)	0.108 (0.099-0.119)	0.129 (0.117-0.142)	0.159 (0.144-0.175)	0.185 (0.166-0.204)	0.215 (0.191-0.236)	0.247 (0.217-0.272)	0.296 (0.256-0.326)	0.338 (0.289-0.373)
3-day	0.049 (0.045-0.053)	0.059 (0.054-0.065)	0.076 (0.069-0.083)	0.090 (0.082-0.098)	0.110 (0.100-0.121)	0.128 (0.116-0.140)	0.148 (0.133-0.162)	0.170 (0.151-0.186)	0.202 (0.177-0.222)	0.230 (0.199-0.253)
4-day	0.038 (0.035-0.042)	0.047 (0.043-0.051)	0.059 (0.055-0.065)	0.070 (0.065-0.076)	0.086 (0.079-0.094)	0.100 (0.091-0.108)	0.115 (0.103-0.125)	0.131 (0.117-0.143)	0.156 (0.137-0.169)	0.177 (0.153-0.193)
7-day	0.025 (0.024-0.027)	0.031 (0.028-0.033)	0.038 (0.036-0.041)	0.045 (0.042-0.048)	0.054 (0.050-0.059)	0.062 (0.057-0.067)	0.071 (0.065-0.077)	0.081 (0.072-0.087)	0.094 (0.084-0.102)	0.106 (0.093-0.115)
10-day	0.020 (0.019-0.021)	0.024 (0.022-0.026)	0.030 (0.028-0.032)	0.034 (0.032-0.037)	0.041 (0.038-0.044)	0.046 (0.043-0.050)	0.052 (0.048-0.056)	0.059 (0.053-0.063)	0.068 (0.061-0.074)	0.076 (0.068-0.082)
20-day	0.013 (0.013-0.014)	0.016 (0.015-0.017)	0.019 (0.018-0.020)	0.022 (0.021-0.023)	0.025 (0.024-0.027)	0.028 (0.026-0.030)	0.031 (0.029-0.033)	0.034 (0.031-0.036)	0.038 (0.035-0.040)	0.041 (0.038-0.044)
30-day	0.011 (0.011-0.012)	0.013 (0.013-0.014)	0.016 (0.015-0.016)	0.017 (0.016-0.018)	0.020 (0.019-0.021)	0.022 (0.021-0.023)	0.024 (0.022-0.025)	0.026 (0.024-0.027)	0.028 (0.026-0.030)	0.030 (0.028-0.032)
45-day	0.009 (0.009-0.010)	0.011 (0.011-0.012)	0.013 (0.012-0.014)	0.014 (0.014-0.015)	0.016 (0.015-0.017)	0.017 (0.017-0.018)	0.019 (0.018-0.020)	0.020 (0.019-0.021)	0.022 (0.020-0.023)	0.023 (0.021-0.024)
60-day	0.008 (0.008-0.009)	0.010 (0.009-0.010)	0.011 (0.011-0.012)	0.013 (0.012-0.013)	0.014 (0.013-0.015)	0.015 (0.014-0.016)	0.016 (0.015-0.017)	0.017 (0.016-0.018)	0.018 (0.017-0.019)	0.019 (0.018-0.020)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

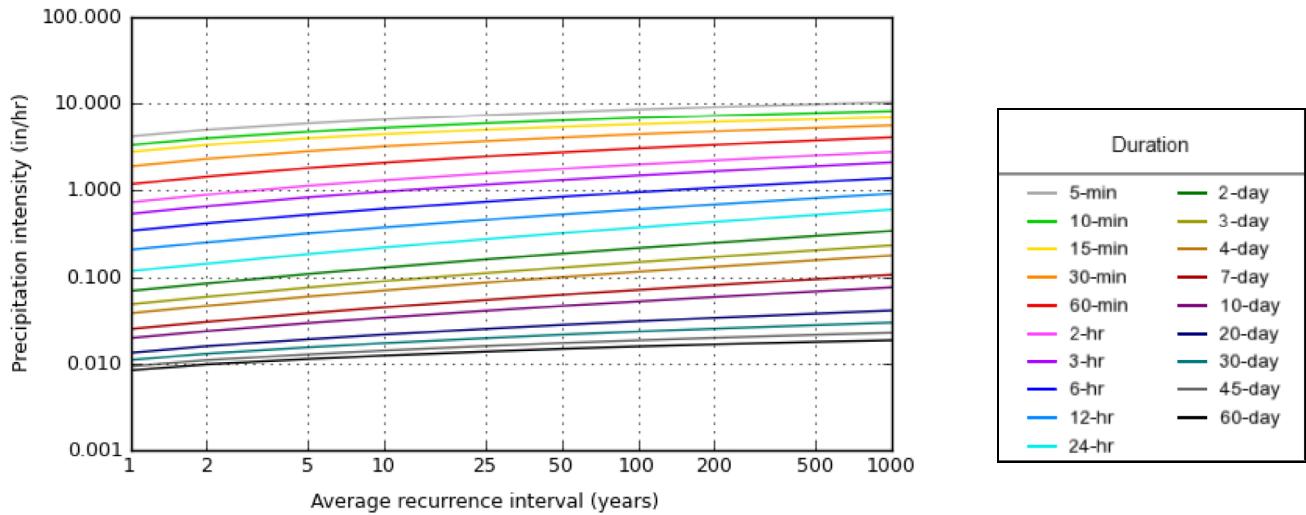
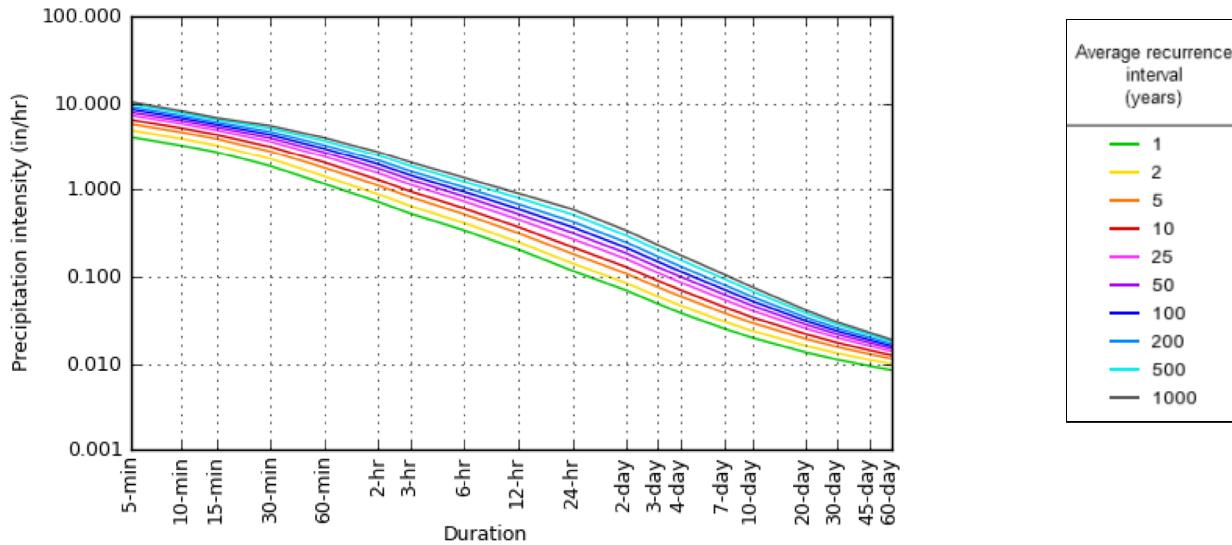
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

PDS-based intensity-duration-frequency (IDF) curves
 Latitude: 40.3621°, Longitude: -73.9965°



Maps & aerials

Small scale terrain



Large scale terrain



Large scale map





[Back to Top](#)

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[National Weather Service](#)
[National Water Center](#)
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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NEW JERSEY 24 HOUR RAINFALL FREQUENCY DATA

Rainfall amounts in Inches

County	1 year	2 year	5 year	10 year	25 year	50 year	100 year
Atlantic	2.72	3.31	4.30	5.16	6.46	7.61	8.90
Bergen	2.75	3.34	4.27	5.07	6.28	7.32	8.47
Burlington	2.77	3.36	4.34	5.18	6.45	7.56	8.81
Camden	2.73	3.31	4.25	5.06	6.28	7.34	8.52
Cape May	2.67	3.25	4.22	5.07	6.34	7.47	8.73
Cumberland	2.69	3.27	4.25	5.09	6.37	7.49	8.76
Essex	2.85	3.44	4.40	5.22	6.44	7.49	8.66
Gloucester	2.71	3.29	4.24	5.05	6.29	7.36	8.55
Hudson	2.73	3.31	4.23	5.02	6.19	7.20	8.31
Hunterdon	2.80	3.38	4.26	5.00	6.09	7.02	8.03
Mercer	2.74	3.31	4.23	5.01	6.19	7.20	8.33
Middlesex	2.76	3.35	4.30	5.12	6.36	7.43	8.63
Monmouth	2.79	3.38	4.38	5.23	6.53	7.66	8.94
Morris	2.94	3.54	4.47	5.24	6.37	7.32	8.35
Ocean	2.81	3.42	4.45	5.33	6.68	7.87	9.20
Passaic	2.87	3.47	4.42	5.23	6.43	7.47	8.62
Salem	2.69	3.26	4.20	5.00	6.22	7.28	8.45
Somerset	2.76	3.34	4.25	5.01	6.15	7.13	8.21
Sussex	2.68	3.22	4.02	4.70	5.72	6.60	7.58
Union	2.80	3.39	4.35	5.17	6.42	7.49	8.69
Warren	2.78	3.34	4.18	4.89	5.93	6.83	7.82

Notes: The average point rainfall amounts listed above were developed from data contained in NOAA Atlas 14 Volume 2.

Point rainfall estimates for specific locations may be obtained from the Precipitation Frequency Data Server located at <http://www.nws.noaa.gov/ohd/hdsc/>

For most hydrologic design procedures, the rainfall amounts listed above may be rounded to the nearest tenth of an inch.

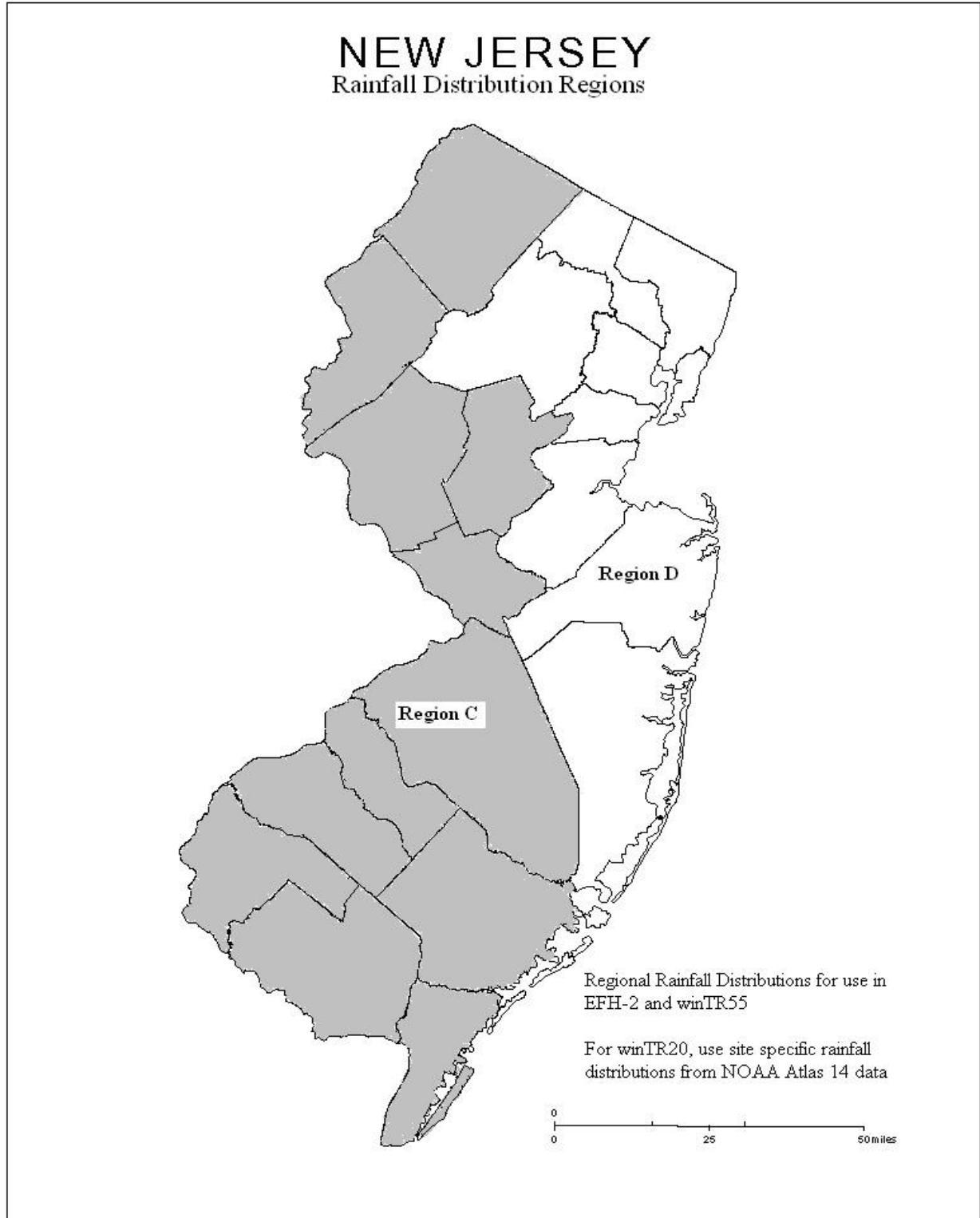


TABLE 7.1

TYPICAL RUNOFF COEFFICIENTS (C VALUES) FOR 100 YEAR FREQUENCY STORM

TABLE 7.1
TYPICAL RUNOFF COEFFICIENTS (C VALUES) FOR 100 YEAR FREQUENCY STORM

<u>Land Use Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
			Hydrologic Soil Group	
<u>Cultivated land:</u>				
without conservation treatment	0.49	0.67	0.81	0.88
with conservation treatment	0.27	0.43	0.61	0.67
<u>Pasture or range land:</u>				
poor condition	0.38	0.63	0.78	0.84
good condition	NA	0.25	0.51	0.65
<u>Meadow: good condition</u>	NA	NA	0.44	0.61
<u>Wood or forest land:</u>				
thin stand, poor cover, no mulch	NA	NA	0.59	0.79
good cover	NA	NA	0.45	0.59
<u>Open spaces, lawns, parks, golf courses, cemeteries:</u>				
good condition, grass cover on 75% or more of area	NA	0.25	0.51	0.65
fair condition, grass cover on 50–75% of area	NA	0.45	0.63	0.74
Commercial and business areas (85% impervious)	0.84	0.90	0.93	0.96
Industrial districts (72% impervious)	0.67	0.81	0.88	0.92
<u>Residential:</u>				
Average lot size				
impermeous	0.59	0.76	0.86	0.90
65% acre	0.59	0.55	0.70	0.80
38% acre	0.25	0.49	0.67	0.78
30% acre	NA	0.45	0.65	0.76
25% acre	NA	0.41	0.63	0.74
20% acre	NA	0.99	0.99	0.99
1 acre	0.99			
Paved parking lots, roofs, driveways, etc.				
Streets and roads:				
paved with curbs and storm sewers	0.99	0.99	0.99	0.99
gravel	0.57	0.76	0.84	0.88
dirt	0.49	0.69	0.80	0.84

Note: NA denotes information is not available; design engineers should rely on another authoritative source.

Source: New Jersey Department of Environmental Protection, Technical Manual for Land Use Regulation Program, Bureaus of Inland and Coastal Regulations, Stream Encroachment Permits (Trenton, New Jersey: Department of Environmental Protection, Revised September 1995) p. 12.

APPENDIX B
Storm Sewer Calculations



Telephone : (732) 312-9800
Fax : (732) 312-9801

1800 Route 34, Suite 101
Wall, New Jersey 07719

PROJECT NUMBER :	15052.003
PROJECT NAME :	132 BINGHAM AVE.
CALCULATED BY :	TLV
CHECKED BY :	DATE:
REVISED BY :	DATE:

RUNOFF COEFFICIENT WORKSHEET					
STRUCTURE NUMBER	SURFACE TYPE	AREA, A (ACRES)	RUNOFF COEFF. (C)	A x C	COMPOSITE RUNOFF COEFF. C = (A x C)/ A
A 7	IMPERVIOUS	0.17	0.99	0.17	0.85
	Lawn Area -Type B	0.04	0.25	0.01	
	WOODS -Type B	0.00	0.25	0.00	
		0.21		0.18	
A 6	IMPERVIOUS	0.18	0.99	0.18	0.92
	Lawn Area -Type B	0.02	0.25	0.01	
	WOODS -Type B	0.00	0.76	0.00	
		0.20		0.18	
A 5	IMPERVIOUS	0.30	0.99	0.30	0.87
	Lawn Area -Type B	0.06	0.25	0.02	
	WOODS -Type B	0.00	0.76	0.00	
		0.36		0.31	
A 4	IMPERVIOUS	0.05	0.99	0.05	0.99
	Lawn Area -Type B	0.00	0.25	0.00	
	WOODS -Type B	0.00	0.76	0.00	
		0.05		0.05	
A 3	IMPERVIOUS	0.06	0.99	0.06	0.81
	Lawn Area -Type B	0.02	0.25	0.01	
	WOODS -Type B	0.00	0.25	0.00	
		0.08		0.06	
	IMPERVIOUS	0.76	0.99	0.75	
	Lawn Area -Type B	0.14	0.25	0.04	
	WOODS -Type B	0.00			



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CALCULATED BY :	TLV
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RUNOFF COEFFICIENT WORKSHEET

STRUCTURE NUMBER	SURFACE TYPE	AREA, A (ACRES)	RUNOFF COEFF. (C)	A x C	COMPOSITE RUNOFF COEFF. C = (A x C)/ A
A 15	IMPERVIOUS	0.10	0.99	0.10	0.74
	Lawn Area -Type B	0.05	0.25	0.01	
	WOODS -Type B	0.00	0.25	0.00	
		0.15		0.11	
A 14	IMPERVIOUS	0.03	0.99	0.03	0.69
	Lawn Area -Type B	0.02	0.25	0.01	
	WOODS -Type B	0.00	0.76	0.00	
		0.05		0.03	
A 13	IMPERVIOUS	0.05	0.99	0.05	0.50
	Lawn Area -Type B	0.10	0.25	0.03	
	WOODS -Type B	0.00	0.76	0.00	
		0.15		0.07	
A 12	IMPERVIOUS	0.14	0.99	0.14	0.83
	Lawn Area -Type B	0.04	0.25	0.01	
	WOODS -Type B	0.00	0.76	0.00	
		0.18		0.15	
A 11	IMPERVIOUS	0.09	0.99	0.09	0.81
	Lawn Area -Type B	0.03	0.25	0.01	
	WOODS -Type B	0.00	0.25	0.00	
		0.12		0.10	
A 10	IMPERVIOUS	0.04	0.99	0.04	0.48
	Lawn Area -Type B	0.09	0.25	0.02	
	WOODS -Type B	0.00	0.25	0.00	
		0.13		0.06	
A 9	IMPERVIOUS	0.17	0.99	0.17	0.85
	Lawn Area -Type B	0.04	0.25	0.01	
	WOODS -Type B	0.00	0.25	0.00	
		0.21		0.18	
A 8	IMPERVIOUS	0.08	0.99	0.08	0.55
	Lawn Area -Type B	0.12	0.25	0.03	
	WOODS -Type B	0.00	0.25	0.00	
		0.20		0.11	
	IMPERVIOUS	0.70	0.99	0.69	
	Lawn Area -Type B	0.49	0.25	0.12	
	WOODS -Type B	0.00			



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1800 Route 34, Suite 101
Wall, New Jersey 07719

PROJECT NUMBER : 15052.003
PROJECT NAME : 132 BINGHAM AVE.
CALCULATED BY : TLV DATE: 01-27-2021
CHECKED BY : DATE:
REVISED BY : DATE:

RUNOFF COEFFICIENT WORKSHEET					
STRUCTURE NUMBER	SURFACE TYPE	AREA, A (ACRES)	RUNOFF COEFF. (C)	A x C	COMPOSITE RUNOFF COEFF. C = (A x C)/ A
B 3	IMPERVIOUS	0.16	0.99	0.16	0.91
	Lawn Area -Type B	0.02	0.25	0.01	
	WOODS -Type B	0.00	0.25	0.00	
		0.18		0.16	
B 1	IMPERVIOUS	0.13	0.99	0.13	0.48
	Lawn Area -Type B	0.28	0.25	0.07	
	WOODS -Type B	0.00	0.76	0.00	
		0.41		0.20	
	IMPERVIOUS	0.29	0.99	0.29	
	Lawn Area -Type B	0.30	0.25	0.08	
	WOODS -Type B	0.00			



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Wall, New Jersey 07719

PROJECT NUMBER :	15052.003
PROJECT NAME :	132 BINGHAM AVE.
CALCULATED BY :	TLV
CHECKED BY :	DATE:
REVISED BY :	DATE:

RUNOFF COEFFICIENT WORKSHEET

STRUCTURE NUMBER	SURFACE TYPE	AREA, A (ACRES)	RUNOFF COEFF. (C)	A x C	COMPOSITE RUNOFF COEFF. C = (A x C)/ A
B 11	IMPERVIOUS	0.01	0.99	0.01	0.44
	Lawn Area -Type B	0.03	0.25	0.01	
	WOODS -Type B	0.00	0.25	0.00	
		0.04		0.02	
B 10	IMPERVIOUS	0.01	0.99	0.01	0.50
	Lawn Area -Type B	0.02	0.25	0.01	
	WOODS -Type B	0.00	0.76	0.00	
		0.03		0.01	
B 9	IMPERVIOUS	0.03	0.99	0.03	0.81
	Lawn Area -Type B	0.01	0.25	0.00	
	WOODS -Type B	0.00	0.76	0.00	
		0.04		0.03	
B 8	IMPERVIOUS	0.41	0.99	0.41	0.86
	Lawn Area -Type B	0.09	0.25	0.02	
	WOODS -Type B	0.00	0.76	0.00	
		0.50		0.43	
B 7	IMPERVIOUS	0.10	0.99	0.10	0.55
	Lawn Area -Type B	0.15	0.25	0.04	
	WOODS -Type B	0.00	0.25	0.00	
		0.25		0.14	
B 6	IMPERVIOUS	0.03	0.99	0.03	0.81
	Lawn Area -Type B	0.01	0.25	0.00	
	WOODS -Type B	0.00	0.25	0.00	
		0.04		0.03	
B 5	IMPERVIOUS	0.06	0.99	0.06	0.69
	Lawn Area -Type B	0.04	0.25	0.01	
	WOODS -Type B	0.00	0.25	0.00	
		0.10		0.07	
B 4	IMPERVIOUS	0.12	0.99	0.12	0.77
	Lawn Area -Type B	0.05	0.25	0.01	
	WOODS -Type B	0.00	0.25	0.00	
		0.17		0.13	
	IMPERVIOUS	0.77	0.99	0.76	
	Lawn Area -Type B	0.40	0.25	0.10	
	WOODS -Type B	0.00			

STORM SEWER DESIGN WORK SHEET

LOCATION		INCREMENTAL AREA				RUNOFF DATA				TIME OF CONCENTRATION				PIPE MATERIAL, RCP MANNING'S 'n' = 0.013			
STRUCTURE NUMBER	UPSTREAM	A _c	WEIGHTED RUNOFF C	SUBAREA A _c X C	TOTAL AREA	A _c X C	MIN	THROUGH PIPE, T _p	TOTAL OR DERRIVED AREA, T _d	RUNOFF PEAK Q	IN/H	DEPTH	FEET	SLDPE %	CAPACITY AT FULL	FPS	FPS
B 11	B 5	0.04	0.44	0.02	0.02	10.0	10.0	5.83	0.1	12	47	0.50	2.5	3.2	1.4	0.5	
B 10	B 9	0.03	0.50	0.02	0.02	10.0	10.0	5.83	0.1	12	59	0.50	2.5	3.2	1.4	0.7	
B 9	B 8	0.04	0.81	0.03	0.05	10.0	10.7	5.70	0.3	12	130	0.50	2.5	3.2	2.2	1.0	
B 8	B 3	0.50	0.86	0.43	0.48	10.0	11.7	5.52	2.6	15	83	0.50	4.6	3.7	3.8	0.4	
B 6	B 5	0.04	0.81	0.03	0.03	10.0	10.0	5.83	0.2	12	57	0.50	2.5	3.2	2.0	0.5	
B 5	B 3	0.10	0.69	0.07	0.12	10.0	10.5	5.74	0.7	12	121	1.00	3.6	4.5	2.8	0.7	
B 7	B 7-1	0.25	0.55	0.14	0.14	10.0	10.0	5.83	0.8	12	113	0.50	2.5	3.2	3.1	0.6	
B 4	B 3	0.17	0.77	0.13	0.13	10.0	10.0	5.83	0.8	15	24	0.50	4.6	3.7	2.8	0.1	
B 3	B 2	0.18	0.91	0.16	0.89	10.0	12.0	5.46	4.9	18	79	0.50	7.4	4.2	4.5	0.3	
B 2	B 1	0.00	0.00	0.00	0.89	10.0	12.3	5.40	4.8	18	59	0.50	7.4	4.2	4.5	0.2	
B 1	UN GR	0.41	0.48	0.20	1.09	10.0	12.6	5.35	5.8	18	8	0.50	7.4	4.2	4.7	0.0	
A 13	A 12	0.15	0.50	0.08	0.08	10.0	10.0	5.83	0.4	12	110	0.50	2.5	3.2	2.3	0.8	
A 12	A 9	0.18	0.83	0.15	0.22	10.0	10.8	5.68	1.3	15	123	0.50	4.6	3.7	3.1	0.7	
A 11	A 9	0.12	0.81	0.10	0.10	10.0	10.0	5.83	0.6	15	24	0.50	4.6	3.7	2.6	0.2	
A 10	A 9	0.13	0.48	0.06	0.06	10.0	10.0	5.83	0.4	12	96	0.50	2.5	3.2	2.3	0.7	
A 9	A 7	0.21	0.85	0.18	0.56	10.0	11.5	5.56	3.1	15	123	0.50	4.6	3.7	4.0	0.5	
A 8	A 7	0.20	0.55	0.11	0.11	10.0	10.0	5.83	0.6	12	108	0.50	2.5	3.2	2.6	0.7	
A 7	A 5	0.21	0.85	0.18	0.85	10.0	12.0	5.46	4.6	18	78	0.50	7.4	4.2	4.4	0.3	
A 6	A 5	0.20	0.92	0.18	0.18	10.0	10.0	5.83	1.1	15	24	0.50	4.6	3.7	3.0	0.1	
A 5	A 3	0.36	0.87	0.31	1.35	10.0	12.3	5.40	7.3	18	123	0.50	7.4	4.2	4.8	0.4	
A 4	A 3	0.05	0.99	0.05	0.05	10.0	10.0	5.83	0.3	15	24	0.50	4.6	3.7	2.0	0.2	
A 3	A 2	0.08	0.81	0.06	1.46	10.0	12.7	5.74	8.4	24	37	0.40	14.3	4.6	5.3	0.1	
A 2	UN GR	UN GR	UN GR	UN GR	UN GR	UN GR	UN GR	UN GR	UN GR	UN GR	UN GR	UN GR	UN GR	UN GR	UN GR	UN GR	
A 15	A 14	0.15	0.74	0.11	0.11	10.0	10.0	5.83	0.6	12	120	0.50	2.5	3.2	2.6	0.8	
A 14	UN GR	0.05	0.69	0.03	0.15	10.0	10.8	5.68	0.8	12	6	0.52	2.6	3.3	2.8	0.0	
100 YR. Peak Flow - BASIN 1 & 2																	
100 YR. Peak Flow - BASIN 2																	

FPA
FRENCH & PARELLO
ASSOCIATES
1800 ROUTE 34, SUITE 101
WALL, NEW JERSEY NJ 07719
TELEPHONE : (732) 312-9800
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PROJECT NAME : 132 BINGHAM AVE
COMPUTED BY : TLV DATE : 01-27-2021
PROJECT NO. : 15052.003
CHECKED BY : DATE :
REVISED BY : DATE :

APPENDIX C
Predevelopment Runoff Calculations

PRE-DEVELOPMENT

Project Summary

Title	Existing Conditions
Engineer	Bahram Farzaneh
Company	French and Parrello Associates
Date	6/3/2021

Notes

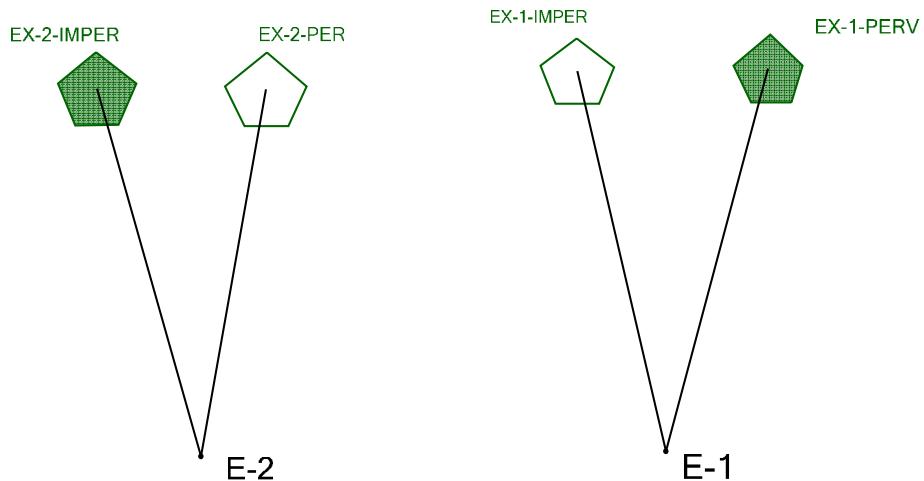


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PRE-DEVELOPMENT

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
EX-1-PERV	Pre-Development 2 Year	2	2,846.000	733.000	0.44
EX-1-PERV	Pre-Development 10 year	10	8,794.000	732.000	2.01
EX-1-PERV	Pre-Development 25 year	25	14,068.000	731.000	3.40
EX-1-PERV	Pre-Development 100 year	100	25,319.000	731.000	6.32
EX-1-IMPER	Pre-Development 2 Year	2	10,146.000	730.000	2.25
EX-1-IMPER	Pre-Development 10 year	10	16,098.000	730.000	3.51
EX-1-IMPER	Pre-Development 25 year	25	20,286.000	730.000	4.39
EX-1-IMPER	Pre-Development 100 year	100	28,052.000	730.000	6.02
EX-2-IMPER	Pre-Development 2 Year	2	1,938.000	731.000	0.42
EX-2-IMPER	Pre-Development 10 year	10	3,075.000	731.000	0.65
EX-2-IMPER	Pre-Development 25 year	25	3,874.000	731.000	0.81
EX-2-IMPER	Pre-Development 100 year	100	5,357.000	731.000	1.12
EX-2-PER	Pre-Development 2 Year	2	2,498.000	734.000	0.40
EX-2-PER	Pre-Development 10 year	10	7,480.000	732.000	1.69
EX-2-PER	Pre-Development 25 year	25	11,852.000	732.000	2.81
EX-2-PER	Pre-Development 100 year	100	21,116.000	732.000	5.13

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
E-1	Pre-Development 2 Year	2	12,992.000	731.000	2.65
E-1	Pre-Development 10 year	10	24,892.000	731.000	5.50
E-1	Pre-Development 25 year	25	34,354.000	731.000	7.77
E-1	Pre-Development 100 year	100	53,371.000	731.000	12.31

PRE-DEVELOPMENT

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft ³)	Time to Peak (min)	Peak Flow (ft ³ /s)
E-2	Pre-Development 2 Year	2	4,436.000	732.000	0.81
E-2	Pre-Development 10 year	10	10,555.000	732.000	2.33
E-2	Pre-Development 25 year	25	15,726.000	732.000	3.61
E-2	Pre-Development 100 year	100	26,473.000	732.000	6.24

PRE-DEVELOPMENT

Subsection: Runoff CN-Area

Return Event: 100 years

Label: EX-1-IMPER

Storm Event: Monmouth NOAA-D (8.94 in)

Scenario: Pre-Development 100 year

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil B	98.000	0.890	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.890	(N/A)	(N/A)	98.000

PRE-DEVELOPMENT

Subsection: Runoff CN-Area

Return Event: 100 years

Label: EX-1-PERV

Storm Event: Monmouth NOAA-D (8.94 in)

Scenario: Pre-Development 100 year

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil B	61.000	1.080	0.0	0.0	61.000
Woods - good - Soil B	55.000	0.700	0.0	0.0	55.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	1.780	(N/A)	(N/A)	58.640

PRE-DEVELOPMENT

Subsection: Runoff CN-Area

Return Event: 100 years

Label: EX-2-IMPER

Storm Event: Monmouth NOAA-D (8.94 in)

Scenario: Pre-Development 100 year

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Impervious Areas - Paved parking lots, roofs, driveways, Streets and roads - Soil B	98.000	0.170	0.0	0.0	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	0.170	(N/A)	(N/A)	98.000

PRE-DEVELOPMENT

Subsection: Runoff CN-Area

Return Event: 100 years

Label: EX-2-PER

Storm Event: Monmouth NOAA-D (8.94 in)

Scenario: Pre-Development 100 year

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
Open space (Lawns,parks etc.) - Good condition; grass cover > 75% - Soil B	61.000	1.110	0.0	0.0	61.000
Woods - good - Soil B	55.000	0.330	0.0	0.0	55.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	1.440	(N/A)	(N/A)	59.625

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 2 years

Label: EX-1-IMPER

Storm Event: Monmouth NOAA-D (3.38 in)

Scenario: Pre-Development 2 Year

Storm Event	Monmouth NOAA-D (3.38 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.38 in
Time of Concentration (Composite)	13.000 min
Area (User Defined)	0.890 acres
<hr/>	
Computational Time Increment	1.733 min
Time to Peak (Computed)	729.733 min
Flow (Peak, Computed)	2.25 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	730.000 min
Flow (Peak Interpolated Output)	2.25 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.890 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.15 in
Runoff Volume (Pervious)	10,166.549 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	10,146.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	13.000 min
Computational Time Increment	1.733 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 2 years

Label: EX-1-IMPER

Storm Event: Monmouth NOAA-D (3.38 in)

Scenario: Pre-Development 2 Year

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	4.65 ft ³ /s
Unit peak time, Tp	8.667 min
Unit receding limb, Tr	34.667 min
Total unit time, Tb	43.333 min

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Label: EX-1-IMPER

Scenario: Pre-Development 10 year

Return Event: 10 years

Storm Event: Monmouth NOAA-D (5.23 in)

Storm Event	Monmouth NOAA-D (5.23 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.23 in
Time of Concentration (Composite)	13.000 min
Area (User Defined)	0.890 acres
<hr/>	
Computational Time Increment	1.733 min
Time to Peak (Computed)	729.733 min
Flow (Peak, Computed)	3.51 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	730.000 min
Flow (Peak Interpolated Output)	3.51 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.890 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.99 in
Runoff Volume (Pervious)	16,130.318 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	16,098.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	13.000 min
Computational Time Increment	1.733 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 10 years

Label: EX-1-IMPER

Storm Event: Monmouth NOAA-D (5.23 in)

Scenario: Pre-Development 10 year

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	4.65 ft ³ /s
Unit peak time, Tp	8.667 min
Unit receding limb, Tr	34.667 min
Total unit time, Tb	43.333 min

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Label: EX-1-IMPER

Scenario: Pre-Development 25 year

Return Event: 25 years

Storm Event: Monmouth NOAA-D (6.53 in)

Storm Event	Monmouth NOAA-D (6.53 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.53 in
Time of Concentration (Composite)	13.000 min
Area (User Defined)	0.890 acres
<hr/>	
Computational Time Increment	1.733 min
Time to Peak (Computed)	729.733 min
Flow (Peak, Computed)	4.39 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	730.000 min
Flow (Peak Interpolated Output)	4.39 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.890 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.29 in
Runoff Volume (Pervious)	20,325.382 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	20,286.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	13.000 min
Computational Time Increment	1.733 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 25 years

Label: EX-1-IMPER

Storm Event: Monmouth NOAA-D (6.53 in)

Scenario: Pre-Development 25 year

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	4.65 ft ³ /s
Unit peak time, Tp	8.667 min
Unit receding limb, Tr	34.667 min
Total unit time, Tb	43.333 min

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 100 years

Label: EX-1-IMPER

Storm Event: Monmouth NOAA-D (8.94 in)

Scenario: Pre-Development 100 year

Storm Event	Monmouth NOAA-D (8.94 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.94 in
Time of Concentration (Composite)	13.000 min
Area (User Defined)	0.890 acres
<hr/>	
Computational Time Increment	1.733 min
Time to Peak (Computed)	729.733 min
Flow (Peak, Computed)	6.02 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	730.000 min
Flow (Peak Interpolated Output)	6.02 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.890 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.70 in
Runoff Volume (Pervious)	28,106.047 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	28,052.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	13.000 min
Computational Time Increment	1.733 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 100 years

Label: EX-1-IMPER

Storm Event: Monmouth NOAA-D (8.94 in)

Scenario: Pre-Development 100 year

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	4.65 ft ³ /s
Unit peak time, Tp	8.667 min
Unit receding limb, Tr	34.667 min
Total unit time, Tb	43.333 min

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Label: EX-1-PERV

Scenario: Pre-Development 2 Year

Return Event: 2 years

Storm Event: Monmouth NOAA-D (3.38 in)

Storm Event	Monmouth NOAA-D (3.38 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.38 in
Time of Concentration (Composite)	13.000 min
Area (User Defined)	1.780 acres
<hr/>	
Computational Time Increment	1.733 min
Time to Peak (Computed)	733.200 min
Flow (Peak, Computed)	0.44 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	733.000 min
Flow (Peak Interpolated Output)	0.44 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	59.000
Area (User Defined)	1.780 acres
Maximum Retention (Pervious)	6.95 in
Maximum Retention (Pervious, 20 percent)	1.39 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.44 in
Runoff Volume (Pervious)	2,862.874 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	2,846.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	13.000 min
Computational Time Increment	1.733 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 2 years

Label: EX-1-PERV

Storm Event: Monmouth NOAA-D (3.38 in)

Scenario: Pre-Development 2 Year

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	9.31 ft ³ /s
Unit peak time, Tp	8.667 min
Unit receding limb, Tr	34.667 min
Total unit time, Tb	43.333 min

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Label: EX-1-PERV

Scenario: Pre-Development 10 year

Return Event: 10 years

Storm Event: Monmouth NOAA-D (5.23 in)

Storm Event	Monmouth NOAA-D (5.23 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.23 in
Time of Concentration (Composite)	13.000 min
Area (User Defined)	1.780 acres
<hr/>	
Computational Time Increment	1.733 min
Time to Peak (Computed)	731.467 min
Flow (Peak, Computed)	2.03 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	732.000 min
Flow (Peak Interpolated Output)	2.01 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	59.000
Area (User Defined)	1.780 acres
Maximum Retention (Pervious)	6.95 in
Maximum Retention (Pervious, 20 percent)	1.39 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.37 in
Runoff Volume (Pervious)	8,831.474 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	8,794.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	13.000 min
Computational Time Increment	1.733 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 10 years

Label: EX-1-PERV

Storm Event: Monmouth NOAA-D (5.23 in)

Scenario: Pre-Development 10 year

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	9.31 ft ³ /s
Unit peak time, Tp	8.667 min
Unit receding limb, Tr	34.667 min
Total unit time, Tb	43.333 min

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Label: EX-1-PERV

Scenario: Pre-Development 25 year

Return Event: 25 years

Storm Event: Monmouth NOAA-D (6.53 in)

Storm Event	Monmouth NOAA-D (6.53 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.53 in
Time of Concentration (Composite)	13.000 min
Area (User Defined)	1.780 acres
<hr/>	
Computational Time Increment	1.733 min
Time to Peak (Computed)	731.467 min
Flow (Peak, Computed)	3.42 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	731.000 min
Flow (Peak Interpolated Output)	3.40 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	59.000
Area (User Defined)	1.780 acres
Maximum Retention (Pervious)	6.95 in
Maximum Retention (Pervious, 20 percent)	1.39 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.19 in
Runoff Volume (Pervious)	14,121.459 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	14,068.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	13.000 min
Computational Time Increment	1.733 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 25 years

Label: EX-1-PERV

Storm Event: Monmouth NOAA-D (6.53 in)

Scenario: Pre-Development 25 year

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	9.31 ft ³ /s
Unit peak time, Tp	8.667 min
Unit receding limb, Tr	34.667 min
Total unit time, Tb	43.333 min

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 100 years

Label: EX-1-PERV

Storm Event: Monmouth NOAA-D (8.94 in)

Scenario: Pre-Development 100 year

Storm Event	Monmouth NOAA-D (8.94 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.94 in
Time of Concentration (Composite)	13.000 min
Area (User Defined)	1.780 acres
<hr/>	
Computational Time Increment	1.733 min
Time to Peak (Computed)	731.467 min
Flow (Peak, Computed)	6.35 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	731.000 min
Flow (Peak Interpolated Output)	6.32 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	59.000
Area (User Defined)	1.780 acres
Maximum Retention (Pervious)	6.95 in
Maximum Retention (Pervious, 20 percent)	1.39 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.93 in
Runoff Volume (Pervious)	25,403.428 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	25,319.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	13.000 min
Computational Time Increment	1.733 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 100 years

Label: EX-1-PERV

Storm Event: Monmouth NOAA-D (8.94 in)

Scenario: Pre-Development 100 year

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	9.31 ft ³ /s
Unit peak time, Tp	8.667 min
Unit receding limb, Tr	34.667 min
Total unit time, Tb	43.333 min

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 2 years

Label: EX-2-IMPER

Storm Event: Monmouth NOAA-D (3.38 in)

Scenario: Pre-Development 2 Year

Storm Event	Monmouth NOAA-D (3.38 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.38 in
Time of Concentration (Composite)	14.000 min
Area (User Defined)	0.170 acres
<hr/>	
Computational Time Increment	1.867 min
Time to Peak (Computed)	731.733 min
Flow (Peak, Computed)	0.42 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	731.000 min
Flow (Peak Interpolated Output)	0.42 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.170 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.15 in
Runoff Volume (Pervious)	1,941.925 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	1,938.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	14.000 min
Computational Time Increment	1.867 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 2 years

Label: EX-2-IMPER

Storm Event: Monmouth NOAA-D (3.38 in)

Scenario: Pre-Development 2 Year

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	0.83 ft ³ /s
Unit peak time, Tp	9.333 min
Unit receding limb, Tr	37.333 min
Total unit time, Tb	46.667 min

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Label: EX-2-IMPER

Scenario: Pre-Development 10 year

Return Event: 10 years

Storm Event: Monmouth NOAA-D (5.23 in)

Storm Event	Monmouth NOAA-D (5.23 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.23 in
Time of Concentration (Composite)	14.000 min
Area (User Defined)	0.170 acres
<hr/>	
Computational Time Increment	1.867 min
Time to Peak (Computed)	731.733 min
Flow (Peak, Computed)	0.65 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	731.000 min
Flow (Peak Interpolated Output)	0.65 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.170 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.99 in
Runoff Volume (Pervious)	3,081.072 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	3,075.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	14.000 min
Computational Time Increment	1.867 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 10 years

Label: EX-2-IMPER

Storm Event: Monmouth NOAA-D (5.23 in)

Scenario: Pre-Development 10 year

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	0.83 ft ³ /s
Unit peak time, Tp	9.333 min
Unit receding limb, Tr	37.333 min
Total unit time, Tb	46.667 min

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Label: EX-2-IMPER

Scenario: Pre-Development 25 year

Return Event: 25 years

Storm Event: Monmouth NOAA-D (6.53 in)

Storm Event	Monmouth NOAA-D (6.53 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.53 in
Time of Concentration (Composite)	14.000 min
Area (User Defined)	0.170 acres
<hr/>	
Computational Time Increment	1.867 min
Time to Peak (Computed)	731.733 min
Flow (Peak, Computed)	0.81 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	731.000 min
Flow (Peak Interpolated Output)	0.81 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.170 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.29 in
Runoff Volume (Pervious)	3,882.376 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	3,874.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	14.000 min
Computational Time Increment	1.867 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 25 years

Label: EX-2-IMPER

Storm Event: Monmouth NOAA-D (6.53 in)

Scenario: Pre-Development 25 year

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	0.83 ft ³ /s
Unit peak time, Tp	9.333 min
Unit receding limb, Tr	37.333 min
Total unit time, Tb	46.667 min

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 100 years

Label: EX-2-IMPER

Storm Event: Monmouth NOAA-D (8.94 in)

Scenario: Pre-Development 100 year

Storm Event	Monmouth NOAA-D (8.94 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.94 in
Time of Concentration (Composite)	14.000 min
Area (User Defined)	0.170 acres
<hr/>	
Computational Time Increment	1.867 min
Time to Peak (Computed)	731.733 min
Flow (Peak, Computed)	1.12 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	731.000 min
Flow (Peak Interpolated Output)	1.12 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.170 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.70 in
Runoff Volume (Pervious)	5,368.571 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	5,357.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	14.000 min
Computational Time Increment	1.867 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 100 years

Label: EX-2-IMPER

Storm Event: Monmouth NOAA-D (8.94 in)

Scenario: Pre-Development 100 year

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	0.83 ft ³ /s
Unit peak time, Tp	9.333 min
Unit receding limb, Tr	37.333 min
Total unit time, Tb	46.667 min

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Label: EX-2-PER

Scenario: Pre-Development 2 Year

Return Event: 2 years

Storm Event: Monmouth NOAA-D (3.38 in)

Storm Event	Monmouth NOAA-D (3.38 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.38 in
Time of Concentration (Composite)	14.000 min
Area (User Defined)	1.440 acres
<hr/>	
Computational Time Increment	1.867 min
Time to Peak (Computed)	733.600 min
Flow (Peak, Computed)	0.41 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	734.000 min
Flow (Peak Interpolated Output)	0.40 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	60.000
Area (User Defined)	1.440 acres
Maximum Retention (Pervious)	6.67 in
Maximum Retention (Pervious, 20 percent)	1.33 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.48 in
Runoff Volume (Pervious)	2,512.922 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	2,498.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	14.000 min
Computational Time Increment	1.867 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 2 years

Label: EX-2-PER

Storm Event: Monmouth NOAA-D (3.38 in)

Scenario: Pre-Development 2 Year

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	6.99 ft ³ /s
Unit peak time, Tp	9.333 min
Unit receding limb, Tr	37.333 min
Total unit time, Tb	46.667 min

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Label: EX-2-PER

Scenario: Pre-Development 10 year

Return Event: 10 years

Storm Event: Monmouth NOAA-D (5.23 in)

Storm Event	Monmouth NOAA-D (5.23 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.23 in
Time of Concentration (Composite)	14.000 min
Area (User Defined)	1.440 acres
<hr/>	
Computational Time Increment	1.867 min
Time to Peak (Computed)	731.733 min
Flow (Peak, Computed)	1.69 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	732.000 min
Flow (Peak Interpolated Output)	1.69 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	60.000
Area (User Defined)	1.440 acres
Maximum Retention (Pervious)	6.67 in
Maximum Retention (Pervious, 20 percent)	1.33 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.44 in
Runoff Volume (Pervious)	7,513.714 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	7,480.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	14.000 min
Computational Time Increment	1.867 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 10 years

Label: EX-2-PER

Storm Event: Monmouth NOAA-D (5.23 in)

Scenario: Pre-Development 10 year

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	6.99 ft ³ /s
Unit peak time, Tp	9.333 min
Unit receding limb, Tr	37.333 min
Total unit time, Tb	46.667 min

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Label: EX-2-PER

Scenario: Pre-Development 25 year

Return Event: 25 years

Storm Event: Monmouth NOAA-D (6.53 in)

Storm Event	Monmouth NOAA-D (6.53 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.53 in
Time of Concentration (Composite)	14.000 min
Area (User Defined)	1.440 acres
<hr/>	
Computational Time Increment	1.867 min
Time to Peak (Computed)	731.733 min
Flow (Peak, Computed)	2.82 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	732.000 min
Flow (Peak Interpolated Output)	2.81 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	60.000
Area (User Defined)	1.440 acres
Maximum Retention (Pervious)	6.67 in
Maximum Retention (Pervious, 20 percent)	1.33 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.28 in
Runoff Volume (Pervious)	11,899.045 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	11,852.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	14.000 min
Computational Time Increment	1.867 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 25 years

Label: EX-2-PER

Storm Event: Monmouth NOAA-D (6.53 in)

Scenario: Pre-Development 25 year

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	6.99 ft ³ /s
Unit peak time, Tp	9.333 min
Unit receding limb, Tr	37.333 min
Total unit time, Tb	46.667 min

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 100 years

Label: EX-2-PER

Storm Event: Monmouth NOAA-D (8.94 in)

Scenario: Pre-Development 100 year

Storm Event	Monmouth NOAA-D (8.94 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.94 in
Time of Concentration (Composite)	14.000 min
Area (User Defined)	1.440 acres
<hr/>	
Computational Time Increment	1.867 min
Time to Peak (Computed)	731.733 min
Flow (Peak, Computed)	5.16 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	732.000 min
Flow (Peak Interpolated Output)	5.13 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	60.000
Area (User Defined)	1.440 acres
Maximum Retention (Pervious)	6.67 in
Maximum Retention (Pervious, 20 percent)	1.33 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.05 in
Runoff Volume (Pervious)	21,190.074 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	21,116.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	14.000 min
Computational Time Increment	1.867 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

PRE-DEVELOPMENT

Subsection: Unit Hydrograph Summary

Return Event: 100 years

Label: EX-2-PER

Storm Event: Monmouth NOAA-D (8.94 in)

Scenario: Pre-Development 100 year

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	6.99 ft ³ /s
Unit peak time, Tp	9.333 min
Unit receding limb, Tr	37.333 min
Total unit time, Tb	46.667 min

PRE-DEVELOPMENT

Subsection: Addition Summary

Return Event: 2 years

Label: E-1

Storm Event: Monmouth NOAA-D (3.38 in)

Scenario: Pre-Development 2 Year

Summary for Hydrograph Addition at 'E-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-1-IMPER
<Catchment to Outflow Node>	EX-1-PERV

Node Inflows

Inflow Type	Element	Volume (ft ³)	Time to Peak (min)	Flow (Peak) (ft ³ /s)
Flow (From)	EX-1-IMPER	10,145.989	730.000	2.25
Flow (From)	EX-1-PERV	2,846.473	733.000	0.44
Flow (In)	E-1	12,992.462	731.000	2.65

PRE-DEVELOPMENT

Subsection: Addition Summary

Return Event: 10 years

Label: E-1

Storm Event: Monmouth NOAA-D (5.23 in)

Scenario: Pre-Development 10 year

Summary for Hydrograph Addition at 'E-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-1-IMPER
<Catchment to Outflow Node>	EX-1-PERV

Node Inflows

Inflow Type	Element	Volume (ft ³)	Time to Peak (min)	Flow (Peak) (ft ³ /s)
Flow (From)	EX-1-IMPER	16,098.444	730.000	3.51
Flow (From)	EX-1-PERV	8,793.999	732.000	2.01
Flow (In)	E-1	24,892.443	731.000	5.50

PRE-DEVELOPMENT

Subsection: Addition Summary

Label: E-1

Scenario: Pre-Development 25 year

Return Event: 25 years

Storm Event: Monmouth NOAA-D (6.53 in)

Summary for Hydrograph Addition at 'E-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-1-IMPER
<Catchment to Outflow Node>	EX-1-PERV

Node Inflows

Inflow Type	Element	Volume (ft ³)	Time to Peak (min)	Flow (Peak) (ft ³ /s)
Flow (From)	EX-1-IMPER	20,285.566	730.000	4.39
Flow (From)	EX-1-PERV	14,067.945	731.000	3.40
Flow (In)	E-1	34,353.511	731.000	7.77

PRE-DEVELOPMENT

Subsection: Addition Summary

Return Event: 100 years

Label: E-1

Storm Event: Monmouth NOAA-D (8.94 in)

Scenario: Pre-Development 100 year

Summary for Hydrograph Addition at 'E-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-1-IMPER
<Catchment to Outflow Node>	EX-1-PERV

Node Inflows

Inflow Type	Element	Volume (ft ³)	Time to Peak (min)	Flow (Peak) (ft ³ /s)
Flow (From)	EX-1-IMPER	28,051.514	730.000	6.02
Flow (From)	EX-1-PERV	25,319.197	731.000	6.32
Flow (In)	E-1	53,370.711	731.000	12.31

PRE-DEVELOPMENT

Subsection: Addition Summary

Return Event: 2 years

Label: E-2

Storm Event: Monmouth NOAA-D (3.38 in)

Scenario: Pre-Development 2 Year

Summary for Hydrograph Addition at 'E-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-2-IMPER
<Catchment to Outflow Node>	EX-2-PER

Node Inflows

Inflow Type	Element	Volume (ft ³)	Time to Peak (min)	Flow (Peak) (ft ³ /s)
Flow (From)	EX-2-IMPER	1,937.719	731.000	0.42
Flow (From)	EX-2-PER	2,497.950	734.000	0.40
Flow (In)	E-2	4,435.668	732.000	0.81

PRE-DEVELOPMENT

Subsection: Addition Summary

Return Event: 10 years

Label: E-2

Storm Event: Monmouth NOAA-D (5.23 in)

Scenario: Pre-Development 10 year

Summary for Hydrograph Addition at 'E-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-2-IMPER
<Catchment to Outflow Node>	EX-2-PER

Node Inflows

Inflow Type	Element	Volume (ft ³)	Time to Peak (min)	Flow (Peak) (ft ³ /s)
Flow (From)	EX-2-IMPER	3,074.551	731.000	0.65
Flow (From)	EX-2-PER	7,480.188	732.000	1.69
Flow (In)	E-2	10,554.739	732.000	2.33

PRE-DEVELOPMENT

Subsection: Addition Summary

Return Event: 25 years

Label: E-2

Storm Event: Monmouth NOAA-D (6.53 in)

Scenario: Pre-Development 25 year

Summary for Hydrograph Addition at 'E-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-2-IMPER
<Catchment to Outflow Node>	EX-2-PER

Node Inflows

Inflow Type	Element	Volume (ft ³)	Time to Peak (min)	Flow (Peak) (ft ³ /s)
Flow (From)	EX-2-IMPER	3,874.231	731.000	0.81
Flow (From)	EX-2-PER	11,851.502	732.000	2.81
Flow (In)	E-2	15,725.733	732.000	3.61

PRE-DEVELOPMENT

Subsection: Addition Summary

Return Event: 100 years

Label: E-2

Storm Event: Monmouth NOAA-D (8.94 in)

Scenario: Pre-Development 100 year

Summary for Hydrograph Addition at 'E-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-2-IMPER
<Catchment to Outflow Node>	EX-2-PER

Node Inflows

Inflow Type	Element	Volume (ft ³)	Time to Peak (min)	Flow (Peak) (ft ³ /s)
Flow (From)	EX-2-IMPER	5,357.414	731.000	1.12
Flow (From)	EX-2-PER	21,115.803	732.000	5.13
Flow (In)	E-2	26,473.218	732.000	6.24

PRE-DEVELOPMENT

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APPENDIX D
Post-Development Runoff Calculations

UNDERGROUND DETENTION SYSTEM CAPACITY - BASIN 1

36" StormTank Modules

Trench Area = 6950.00

Total Volume = 6,950 SF x 3 ft x 0.97* = 20,224.5

Elevation	Depth	Total Volume cu. ft.
42.50	0.00	0.00
42.75	0.25	1685.38
43.00	0.50	3370.75
43.25	0.75	5056.13
43.50	1.00	6741.50
43.75	1.25	8426.88
44.00	1.50	10112.25
44.25	1.75	11797.63
44.50	2.00	13483.00
44.75	2.25	15168.38
45.00	2.50	16853.75
45.25	2.75	18539.13
45.50	3.00	20224.50

* Porosity of 36" Stormtank Module = 97%

UNDERGROUND DETENTION SYSTEM CAPACITY - BASIN 2

36" StormTank Modules

Trench Area = 10300.00

Total Volume = 10,300 SF x 3 ft x 0.97* = 29,973

Elevation	Depth	Total Volume cu. ft.
46.50	0.00	0.00
46.75	0.25	2497.75
47.00	0.50	4995.50
47.25	0.75	7493.25
47.50	1.00	9991.00
47.75	1.25	12488.75
48.00	1.50	14986.50
48.25	1.75	17484.25
48.50	2.00	19982.00
48.75	2.25	22479.75
49.00	2.50	24977.50
49.25	2.75	27475.25
49.50	3.00	29973.00

* Porosity of 36" Stormtank Module = 97%

Project Summary

Title	Proposed Conditions
Engineer	Bahram Farzaneh
Company	French and Parrello Associates
Date	6/3/2021

Notes

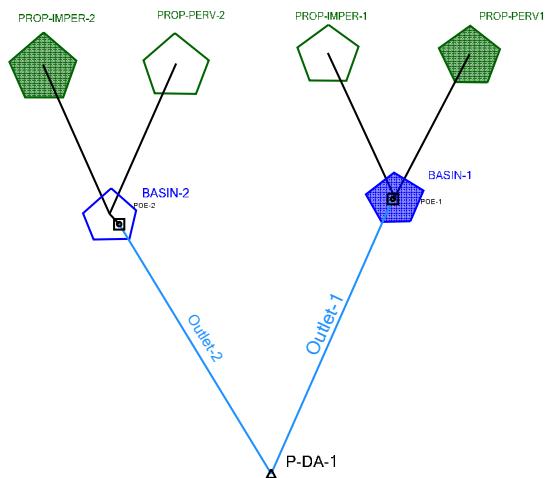


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Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
PROP-PERV1	2 year	2	1,750,000	728.000	0.41
PROP-PERV1	10 year	10	5,085,000	728.000	1.52
PROP-PERV1	25 year	25	7,981,000	728.000	2.46
PROP-PERV1	100 year	100	14,077,000	728.000	4.41
PROP-IMPER-1	2 year	2	16,891,000	727.000	4.57
PROP-IMPER-1	10 year	10	26,800,000	727.000	7.11
PROP-IMPER-1	25 year	25	33,770,000	727.000	8.90
PROP-IMPER-1	100 year	100	46,698,000	727.000	12.20
PROP-IMPER-2	2 year	2	10,958,000	726.000	3.17
PROP-IMPER-2	10 year	10	17,386,000	726.000	4.93
PROP-IMPER-2	25 year	25	21,907,000	726.000	6.17
PROP-IMPER-2	100 year	100	30,294,000	726.000	8.45
PROP-PERV-2	2 year	2	1,714,000	727.000	0.44
PROP-PERV-2	10 year	10	4,978,000	727.000	1.62
PROP-PERV-2	25 year	25	7,812,000	727.000	2.62
PROP-PERV-2	100 year	100	13,778,000	727.000	4.66

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
P-DA-1	2 year	2	25,219,000	769.000	0.94
P-DA-1	10 year	10	42,136,000	754.000	1.91
P-DA-1	25 year	25	54,325,000	743.000	3.38
P-DA-1	100 year	100	77,267,000	737.000	7.01

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
BASIN-1 (IN)	2 year	2	18,641,000	728.000	4.96	(N/A)	(N/A)
BASIN-1 (OUT)	2 year	2	17,261,000	762.000	0.76	43.64	7,714,000
BASIN-1 (IN)	10 year	10	31,885,000	728.000	8.61	(N/A)	(N/A)
BASIN-1 (OUT)	10 year	10	30,055,000	754.000	1.66	44.36	12,533,000
BASIN-1 (IN)	25 year	25	41,751,000	728.000	11.33	(N/A)	(N/A)
BASIN-1 (OUT)	25 year	25	39,640,000	743.000	3.10	44.76	15,206,000
BASIN-1 (IN)	100 year	100	60,776,000	728.000	16.56	(N/A)	(N/A)
BASIN-1 (OUT)	100 year	100	58,115,000	737.000	6.67	45.47	20,010,000

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft ³)	Time to Peak (min)	Peak Flow (ft ³ /s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft ³)
BASIN-2 (IN)	2 year	2	12,671.000	727.000	3.61	(N/A)	(N/A)
BASIN-2 (OUT)	2 year	2	7,958.000	860.000	0.19	47.25	7,534.000
BASIN-2 (IN)	10 year	10	22,364.000	727.000	6.55	(N/A)	(N/A)
BASIN-2 (OUT)	10 year	10	12,081.000	893.000	0.26	47.88	13,797.000
BASIN-2 (IN)	25 year	25	29,719.000	727.000	8.78	(N/A)	(N/A)
BASIN-2 (OUT)	25 year	25	14,685.000	908.000	0.31	48.38	18,787.000
BASIN-2 (IN)	100 year	100	44,072.000	727.000	13.11	(N/A)	(N/A)
BASIN-2 (OUT)	100 year	100	19,152.000	951.000	0.41	49.39	28,907.000

Subsection: Unit Hydrograph Summary
Label: PROP-IMPER-1
Scenario: 2 year

Return Event: 2 years
Storm Event: Monmouth NOAA-D (3.38 in)

Storm Event	Monmouth NOAA-D (3.38 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.4 in
Time of Concentration (Composite)	7.000 min
Area (User Defined)	1.480 acres
<hr/>	
Computational Time Increment	0.933 min
Time to Peak (Computed)	727.067 min
Flow (Peak, Computed)	4.58 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	727.000 min
Flow (Peak Interpolated Output)	4.57 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	1.480 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.1 in
Runoff Volume (Pervious)	16,906.171 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	16,891.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	7.000 min
Computational Time Increment	0.933 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	14.37 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: PROP-IMPER-1
Scenario: 2 year

Return Event: 2 years
Storm Event: Monmouth NOAA-D (3.38 in)

SCS Unit Hydrograph Parameters

Unit peak time, Tp	4.667 min
Unit receding limb, Tr	18.667 min
Total unit time, Tb	23.333 min

Subsection: Unit Hydrograph Summary
Label: PROP-IMPER-1
Scenario: 10 year

Return Event: 10 years
Storm Event: Monmouth NOAA-D (5.23 in)

Storm Event	Monmouth NOAA-D (5.23 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.2 in
Time of Concentration (Composite)	7.000 min
Area (User Defined)	1.480 acres
<hr/>	
Computational Time Increment	0.933 min
Time to Peak (Computed)	727.067 min
Flow (Peak, Computed)	7.13 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	727.000 min
Flow (Peak Interpolated Output)	7.11 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	1.480 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	5.0 in
Runoff Volume (Pervious)	26,823.450 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	26,800.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	

Time of Concentration (Composite)	7.000 min
Computational Time Increment	0.933 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	14.37 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: PROP-IMPER-1
Scenario: 10 year

Return Event: 10 years
Storm Event: Monmouth NOAA-D (5.23 in)

SCS Unit Hydrograph Parameters

Unit peak time, Tp	4.667 min
Unit receding limb, Tr	18.667 min
Total unit time, Tb	23.333 min

Subsection: Unit Hydrograph Summary
Label: PROP-IMPER-1
Scenario: 25 year

Return Event: 25 years
Storm Event: Monmouth NOAA-D (6.53 in)

Storm Event	Monmouth NOAA-D (6.53 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.5 in
Time of Concentration (Composite)	7.000 min
Area (User Defined)	1.480 acres
<hr/>	
Computational Time Increment	0.933 min
Time to Peak (Computed)	727.067 min
Flow (Peak, Computed)	8.92 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	727.000 min
Flow (Peak Interpolated Output)	8.90 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	1.480 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.3 in
Runoff Volume (Pervious)	33,799.511 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	33,770.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	

Time of Concentration (Composite)	7.000 min
Computational Time Increment	0.933 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	14.37 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: PROP-IMPER-1
Scenario: 25 year

Return Event: 25 years
Storm Event: Monmouth NOAA-D (6.53 in)

SCS Unit Hydrograph Parameters

Unit peak time, Tp	4.667 min
Unit receding limb, Tr	18.667 min
Total unit time, Tb	23.333 min

Subsection: Unit Hydrograph Summary
Label: PROP-IMPER-1
Scenario: 100 year

Return Event: 100 years
Storm Event: Monmouth NOAA-D (8.94 in)

Storm Event	Monmouth NOAA-D (8.94 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.9 in
Time of Concentration (Composite)	7.000 min
Area (User Defined)	1.480 acres
<hr/>	
Computational Time Increment	0.933 min
Time to Peak (Computed)	727.067 min
Flow (Peak, Computed)	12.23 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	727.000 min
Flow (Peak Interpolated Output)	12.20 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	1.480 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.7 in
Runoff Volume (Pervious)	46,738.146 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	46,698.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	

Time of Concentration (Composite)	7.000 min
Computational Time Increment	0.933 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	14.37 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: PROP-IMPER-1
Scenario: 100 year

Return Event: 100 years
Storm Event: Monmouth NOAA-D (8.94 in)

SCS Unit Hydrograph Parameters

Unit peak time, Tp	4.667 min
Unit receding limb, Tr	18.667 min
Total unit time, Tb	23.333 min

Subsection: Unit Hydrograph Summary
Label: PROP-IMPER-2
Scenario: 2 year

Return Event: 2 years
Storm Event: Monmouth NOAA-D (3.38 in)

Storm Event	Monmouth NOAA-D (3.38 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.4 in
Time of Concentration (Composite)	5.000 min
Area (User Defined)	0.960 acres
<hr/>	
Computational Time Increment	0.667 min
Time to Peak (Computed)	726.667 min
Flow (Peak, Computed)	3.19 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	726.000 min
Flow (Peak Interpolated Output)	3.17 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.960 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.1 in
Runoff Volume (Pervious)	10,966.165 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	10,958.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	5.000 min
Computational Time Increment	0.667 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	13.05 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: PROP-IMPER-2
Scenario: 2 year

Return Event: 2 years
Storm Event: Monmouth NOAA-D (3.38 in)

SCS Unit Hydrograph Parameters

Unit peak time, Tp	3.333 min
Unit receding limb, Tr	13.333 min
Total unit time, Tb	16.667 min

Subsection: Unit Hydrograph Summary
Label: PROP-IMPER-2
Scenario: 10 year

Return Event: 10 years
Storm Event: Monmouth NOAA-D (5.23 in)

Storm Event	Monmouth NOAA-D (5.23 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.2 in
Time of Concentration (Composite)	5.000 min
Area (User Defined)	0.960 acres
<hr/>	
Computational Time Increment	0.667 min
Time to Peak (Computed)	726.667 min
Flow (Peak, Computed)	4.97 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	726.000 min
Flow (Peak Interpolated Output)	4.93 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.960 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	5.0 in
Runoff Volume (Pervious)	17,398.995 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	17,386.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	5.000 min
Computational Time Increment	0.667 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	13.05 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: PROP-IMPER-2
Scenario: 10 year

Return Event: 10 years
Storm Event: Monmouth NOAA-D (5.23 in)

SCS Unit Hydrograph Parameters

Unit peak time, Tp	3.333 min
Unit receding limb, Tr	13.333 min
Total unit time, Tb	16.667 min

Subsection: Unit Hydrograph Summary
Label: PROP-IMPER-2
Scenario: 25 year

Return Event: 25 years
Storm Event: Monmouth NOAA-D (6.53 in)

Storm Event	Monmouth NOAA-D (6.53 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.5 in
Time of Concentration (Composite)	5.000 min
Area (User Defined)	0.960 acres
<hr/>	
Computational Time Increment	0.667 min
Time to Peak (Computed)	726.667 min
Flow (Peak, Computed)	6.22 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	726.000 min
Flow (Peak Interpolated Output)	6.17 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.960 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.3 in
Runoff Volume (Pervious)	21,924.008 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	21,907.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	5.000 min
Computational Time Increment	0.667 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	13.05 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: PROP-IMPER-2
Scenario: 25 year

Return Event: 25 years
Storm Event: Monmouth NOAA-D (6.53 in)

SCS Unit Hydrograph Parameters

Unit peak time, Tp	3.333 min
Unit receding limb, Tr	13.333 min
Total unit time, Tb	16.667 min

Subsection: Unit Hydrograph Summary
Label: PROP-IMPER-2
Scenario: 100 year

Return Event: 100 years
Storm Event: Monmouth NOAA-D (8.94 in)

Storm Event	Monmouth NOAA-D (8.94 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.9 in
Time of Concentration (Composite)	5.000 min
Area (User Defined)	0.960 acres
<hr/>	
Computational Time Increment	0.667 min
Time to Peak (Computed)	726.667 min
Flow (Peak, Computed)	8.52 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	726.000 min
Flow (Peak Interpolated Output)	8.45 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.960 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.7 in
Runoff Volume (Pervious)	30,316.635 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	30,294.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	5.000 min
Computational Time Increment	0.667 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	13.05 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: PROP-IMPER-2
Scenario: 100 year

Return Event: 100 years
Storm Event: Monmouth NOAA-D (8.94 in)

SCS Unit Hydrograph Parameters

Unit peak time, Tp	3.333 min
Unit receding limb, Tr	13.333 min
Total unit time, Tb	16.667 min

Subsection: Unit Hydrograph Summary
Label: PROP-PERV1
Scenario: 2 year

Return Event: 2 years
Storm Event: Monmouth NOAA-D (3.38 in)

Storm Event	Monmouth NOAA-D (3.38 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.4 in
Time of Concentration (Composite)	7.000 min
Area (User Defined)	0.930 acres
<hr/>	
Computational Time Increment	0.933 min
Time to Peak (Computed)	728.000 min
Flow (Peak, Computed)	0.41 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	728.000 min
Flow (Peak Interpolated Output)	0.41 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	0.930 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.5 in
Runoff Volume (Pervious)	1,754.768 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	1,750.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	7.000 min
Computational Time Increment	0.933 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	9.03 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: PROP-PERV1
Scenario: 2 year

Return Event: 2 years
Storm Event: Monmouth NOAA-D (3.38 in)

SCS Unit Hydrograph Parameters

Unit peak time, Tp	4.667 min
Unit receding limb, Tr	18.667 min
Total unit time, Tb	23.333 min

Subsection: Unit Hydrograph Summary
Label: PROP-PERV1
Scenario: 10 year

Return Event: 10 years
Storm Event: Monmouth NOAA-D (5.23 in)

Storm Event	Monmouth NOAA-D (5.23 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.2 in
Time of Concentration (Composite)	7.000 min
Area (User Defined)	0.930 acres
<hr/>	
Computational Time Increment	0.933 min
Time to Peak (Computed)	728.000 min
Flow (Peak, Computed)	1.52 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	728.000 min
Flow (Peak Interpolated Output)	1.52 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	0.930 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.5 in
Runoff Volume (Pervious)	5,095.090 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	5,085.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	7.000 min
Computational Time Increment	0.933 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	9.03 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: PROP-PERV1
Scenario: 10 year

Return Event: 10 years
Storm Event: Monmouth NOAA-D (5.23 in)

SCS Unit Hydrograph Parameters

Unit peak time, Tp	4.667 min
Unit receding limb, Tr	18.667 min
Total unit time, Tb	23.333 min

Subsection: Unit Hydrograph Summary
Label: PROP-PERV1
Scenario: 25 year

Return Event: 25 years
Storm Event: Monmouth NOAA-D (6.53 in)

Storm Event	Monmouth NOAA-D (6.53 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.5 in
Time of Concentration (Composite)	7.000 min
Area (User Defined)	0.930 acres
<hr/>	
Computational Time Increment	0.933 min
Time to Peak (Computed)	728.000 min
Flow (Peak, Computed)	2.46 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	728.000 min
Flow (Peak Interpolated Output)	2.46 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	0.930 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.4 in
Runoff Volume (Pervious)	7,994.562 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	7,981.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	7.000 min
Computational Time Increment	0.933 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	9.03 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: PROP-PERV1
Scenario: 25 year

Return Event: 25 years
Storm Event: Monmouth NOAA-D (6.53 in)

SCS Unit Hydrograph Parameters

Unit peak time, Tp	4.667 min
Unit receding limb, Tr	18.667 min
Total unit time, Tb	23.333 min

Subsection: Unit Hydrograph Summary
Label: PROP-PERV1
Scenario: 100 year

Return Event: 100 years
Storm Event: Monmouth NOAA-D (8.94 in)

Storm Event	Monmouth NOAA-D (8.94 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.9 in
Time of Concentration (Composite)	7.000 min
Area (User Defined)	0.930 acres
<hr/>	
Computational Time Increment	0.933 min
Time to Peak (Computed)	728.000 min
Flow (Peak, Computed)	4.41 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	728.000 min
Flow (Peak Interpolated Output)	4.41 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	0.930 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.2 in
Runoff Volume (Pervious)	14,098.489 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	14,077.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	7.000 min
Computational Time Increment	0.933 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	9.03 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: PROP-PERV1
Scenario: 100 year

Return Event: 100 years
Storm Event: Monmouth NOAA-D (8.94 in)

SCS Unit Hydrograph Parameters

Unit peak time, Tp	4.667 min
Unit receding limb, Tr	18.667 min
Total unit time, Tb	23.333 min

Subsection: Unit Hydrograph Summary
Label: PROP-PERV-2
Scenario: 2 year

Return Event: 2 years
Storm Event: Monmouth NOAA-D (3.38 in)

Storm Event	Monmouth NOAA-D (3.38 in)
Return Event	2 years
Duration	1,440.000 min
Depth	3.4 in
Time of Concentration (Composite)	5.000 min
Area (User Defined)	0.910 acres
<hr/>	
Computational Time Increment	0.667 min
Time to Peak (Computed)	727.333 min
Flow (Peak, Computed)	0.45 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	727.000 min
Flow (Peak Interpolated Output)	0.44 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	0.910 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.5 in
Runoff Volume (Pervious)	1,717.031 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	1,714.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	5.000 min
Computational Time Increment	0.667 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	12.37 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: PROP-PERV-2
Scenario: 2 year

Return Event: 2 years
Storm Event: Monmouth NOAA-D (3.38 in)

SCS Unit Hydrograph Parameters

Unit peak time, Tp	3.333 min
Unit receding limb, Tr	13.333 min
Total unit time, Tb	16.667 min

Subsection: Unit Hydrograph Summary
Label: PROP-PERV-2
Scenario: 10 year

Return Event: 10 years
Storm Event: Monmouth NOAA-D (5.23 in)

Storm Event	Monmouth NOAA-D (5.23 in)
Return Event	10 years
Duration	1,440.000 min
Depth	5.2 in
Time of Concentration (Composite)	5.000 min
Area (User Defined)	0.910 acres
<hr/>	
Computational Time Increment	0.667 min
Time to Peak (Computed)	727.333 min
Flow (Peak, Computed)	1.63 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	727.000 min
Flow (Peak Interpolated Output)	1.62 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	0.910 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.5 in
Runoff Volume (Pervious)	4,985.518 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	4,978.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	5.000 min
Computational Time Increment	0.667 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	12.37 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: PROP-PERV-2
Scenario: 10 year

Return Event: 10 years
Storm Event: Monmouth NOAA-D (5.23 in)

SCS Unit Hydrograph Parameters

Unit peak time, Tp	3.333 min
Unit receding limb, Tr	13.333 min
Total unit time, Tb	16.667 min

Subsection: Unit Hydrograph Summary
Label: PROP-PERV-2
Scenario: 25 year

Return Event: 25 years
Storm Event: Monmouth NOAA-D (6.53 in)

Storm Event	Monmouth NOAA-D (6.53 in)
Return Event	25 years
Duration	1,440.000 min
Depth	6.5 in
Time of Concentration (Composite)	5.000 min
Area (User Defined)	0.910 acres
<hr/>	
Computational Time Increment	0.667 min
Time to Peak (Computed)	726.667 min
Flow (Peak, Computed)	2.62 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	727.000 min
Flow (Peak Interpolated Output)	2.62 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	0.910 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.4 in
Runoff Volume (Pervious)	7,822.636 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	7,812.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	5.000 min
Computational Time Increment	0.667 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	12.37 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: PROP-PERV-2
Scenario: 25 year

Return Event: 25 years
Storm Event: Monmouth NOAA-D (6.53 in)

SCS Unit Hydrograph Parameters

Unit peak time, Tp	3.333 min
Unit receding limb, Tr	13.333 min
Total unit time, Tb	16.667 min

Subsection: Unit Hydrograph Summary
Label: PROP-PERV-2
Scenario: 100 year

Return Event: 100 years
Storm Event: Monmouth NOAA-D (8.94 in)

Storm Event	Monmouth NOAA-D (8.94 in)
Return Event	100 years
Duration	1,440.000 min
Depth	8.9 in
Time of Concentration (Composite)	5.000 min
Area (User Defined)	0.910 acres
<hr/>	
Computational Time Increment	0.667 min
Time to Peak (Computed)	726.667 min
Flow (Peak, Computed)	4.68 ft ³ /s
Output Increment	1.000 min
Time to Flow (Peak Interpolated Output)	727.000 min
Flow (Peak Interpolated Output)	4.66 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	0.910 acres
Maximum Retention (Pervious)	6.4 in
Maximum Retention (Pervious, 20 percent)	1.3 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.2 in
Runoff Volume (Pervious)	13,795.295 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	13,778.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	

Time of Concentration (Composite)	5.000 min
Computational Time Increment	0.667 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	12.37 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: PROP-PERV-2
Scenario: 100 year

Return Event: 100 years
Storm Event: Monmouth NOAA-D (8.94 in)

SCS Unit Hydrograph Parameters

Unit peak time, Tp	3.333 min
Unit receding limb, Tr	13.333 min
Total unit time, Tb	16.667 min

Subsection: Elevation-Volume-Flow Table (Pond)
 Label: BASIN-1
 Scenario: 100 year

Return Event: 100 years
 Storm Event: Monmouth NOAA-D (8.94 in)

Infiltration

Infiltration Method (Computed)	No Infiltration
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Initial Conditions

Elevation (Water Surface, Initial)	42.50 ft
Volume (Initial)	0.000 ft ³
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	1.000 min

Elevation (ft)	Outflow (ft ³ /s)	Storage (ft ³)	Area (acres)	Infiltration (ft ³ /s)	Flow (Total) (ft ³ /s)	2S/t + O (ft ³ /s)
42.50	0.00	0.000	0.000	0.00	0.00	0.00
42.60	0.02	674.152	0.000	0.00	0.02	22.49
42.70	0.08	1,348.304	0.000	0.00	0.08	45.03
42.80	0.18	2,022.454	0.000	0.00	0.18	67.59
42.90	0.29	2,696.602	0.000	0.00	0.29	90.18
43.00	0.41	3,370.750	0.000	0.00	0.41	112.77
43.10	0.48	4,044.902	0.000	0.00	0.48	135.31
43.20	0.54	4,719.054	0.000	0.00	0.54	157.85
43.30	0.60	5,393.204	0.000	0.00	0.60	180.37
43.40	0.65	6,067.352	0.000	0.00	0.65	202.90
43.50	0.70	6,741.500	0.000	0.00	0.70	225.41
43.60	0.74	7,415.652	0.000	0.00	0.74	247.93
43.70	0.78	8,089.804	0.000	0.00	0.78	270.44
43.80	0.82	8,763.954	0.000	0.00	0.82	292.95
43.90	0.86	9,438.102	0.000	0.00	0.86	315.46
44.00	0.90	10,112.250	0.000	0.00	0.90	337.97
44.10	1.02	10,786.402	0.000	0.00	1.02	360.57
44.20	1.23	11,460.554	0.000	0.00	1.23	383.25
44.30	1.49	12,134.704	0.000	0.00	1.49	405.98
44.40	1.79	12,808.852	0.000	0.00	1.79	428.75
44.50	2.12	13,483.000	0.000	0.00	2.12	451.55
44.60	2.48	14,157.152	0.000	0.00	2.48	474.39
44.70	2.87	14,831.304	0.000	0.00	2.87	497.25
44.80	3.29	15,505.454	0.000	0.00	3.29	520.14
44.90	3.72	16,179.602	0.000	0.00	3.72	543.04
45.00	4.17	16,853.750	0.000	0.00	4.17	565.96
45.10	4.63	17,527.902	0.000	0.00	4.63	588.90
45.20	5.12	18,202.054	0.000	0.00	5.12	611.85
45.30	5.61	18,876.204	0.000	0.00	5.61	634.82
45.38	6.04	19,415.522	0.000	0.00	6.04	653.23

Subsection: Elevation-Volume-Flow Table (Pond)
Label: BASIN-1
Scenario: 100 year

Return Event: 100 years
Storm Event: Monmouth NOAA-D (8.94 in)

Elevation (ft)	Outflow (ft ³ /s)	Storage (ft ³)	Area (acres)	Infiltration (ft ³ /s)	Flow (Total) (ft ³ /s)	2S/t + O (ft ³ /s)
45.40	6.17	19,550.352	0.000	0.00	6.17	657.85
45.50	6.91	20,224.500	0.000	0.00	6.91	681.06

Subsection: Level Pool Pond Routing Summary
Label: BASIN-1 (IN)
Scenario: 2 year

Return Event: 2 years
Storm Event: Monmouth NOAA-D (3.38 in)

Infiltration

Infiltration Method (Computed)	No Infiltration
-----------------------------------	-----------------

Initial Conditions

Elevation (Water Surface, Initial)	42.50 ft
Volume (Initial)	0.000 ft ³
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	1.000 min

Inflow/Outflow Hydrograph Summary

Flow (Peak In)	4.96 ft ³ /s	Time to Peak (Flow, In)	728.000 min
Flow (Peak Outlet)	0.76 ft ³ /s	Time to Peak (Flow, Outlet)	762.000 min

Elevation (Water Surface, Peak)	43.64 ft
Volume (Peak)	7,713.844 ft ³

Mass Balance (ft³)

Volume (Initial)	0.000 ft ³
Volume (Total Inflow)	18,641.000 ft ³
Volume (Total Infiltration)	0.000 ft ³
Volume (Total Outlet Outflow)	17,261.000 ft ³
Volume (Retained)	1,375.000 ft ³
Volume (Unrouted)	-5.000 ft ³
Error (Mass Balance)	0.0 %

Subsection: Level Pool Pond Routing Summary
Label: BASIN-1 (IN)
Scenario: 10 year

Return Event: 10 years
Storm Event: Monmouth NOAA-D (5.23 in)

Infiltration

Infiltration Method (Computed)	No Infiltration
-----------------------------------	-----------------

Initial Conditions

Elevation (Water Surface, Initial)	42.50 ft
Volume (Initial)	0.000 ft ³
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	1.000 min

Inflow/Outflow Hydrograph Summary

Flow (Peak In)	8.61 ft ³ /s	Time to Peak (Flow, In)	728.000 min
Flow (Peak Outlet)	1.66 ft ³ /s	Time to Peak (Flow, Outlet)	754.000 min

Elevation (Water Surface, Peak)	44.36 ft
Volume (Peak)	12,532.789 ft ³

Mass Balance (ft³)

Volume (Initial)	0.000 ft ³
Volume (Total Inflow)	31,885.000 ft ³
Volume (Total Infiltration)	0.000 ft ³
Volume (Total Outlet Outflow)	30,055.000 ft ³
Volume (Retained)	1,821.000 ft ³
Volume (Unrouted)	-9.000 ft ³
Error (Mass Balance)	0.0 %

Subsection: Level Pool Pond Routing Summary
Label: BASIN-1 (IN)
Scenario: 25 year

Return Event: 25 years
Storm Event: Monmouth NOAA-D (6.53 in)

Infiltration

Infiltration Method (Computed)	No Infiltration
-----------------------------------	-----------------

Initial Conditions

Elevation (Water Surface, Initial)	42.50 ft
Volume (Initial)	0.000 ft ³
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	1.000 min

Inflow/Outflow Hydrograph Summary

Flow (Peak In)	11.33 ft ³ /s	Time to Peak (Flow, In)	728.000 min
Flow (Peak Outlet)	3.10 ft ³ /s	Time to Peak (Flow, Outlet)	743.000 min

Elevation (Water Surface, Peak)	44.76 ft
Volume (Peak)	15,205.726 ft ³

Mass Balance (ft³)

Volume (Initial)	0.000 ft ³
Volume (Total Inflow)	41,751.000 ft ³
Volume (Total Infiltration)	0.000 ft ³
Volume (Total Outlet Outflow)	39,640.000 ft ³
Volume (Retained)	2,099.000 ft ³
Volume (Unrouted)	-12.000 ft ³
Error (Mass Balance)	0.0 %

Subsection: Level Pool Pond Routing Summary
Label: BASIN-1 (IN)
Scenario: 100 year

Return Event: 100 years
Storm Event: Monmouth NOAA-D (8.94 in)

Infiltration

Infiltration Method (Computed)	No Infiltration
-----------------------------------	-----------------

Initial Conditions

Elevation (Water Surface, Initial)	42.50 ft
Volume (Initial)	0.000 ft ³
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	1.000 min

Inflow/Outflow Hydrograph Summary

Flow (Peak In)	16.56 ft ³ /s	Time to Peak (Flow, In)	728.000 min
Flow (Peak Outlet)	6.67 ft ³ /s	Time to Peak (Flow, Outlet)	737.000 min

Elevation (Water Surface, Peak)	45.47 ft
Volume (Peak)	20,010.170 ft ³

Mass Balance (ft³)

Volume (Initial)	0.000 ft ³
Volume (Total Inflow)	60,776.000 ft ³
Volume (Total Infiltration)	0.000 ft ³
Volume (Total Outlet Outflow)	58,115.000 ft ³
Volume (Retained)	2,644.000 ft ³
Volume (Unrouted)	-17.000 ft ³
Error (Mass Balance)	0.0 %

Subsection: Elevation-Volume-Flow Table (Pond)
 Label: BASIN-2
 Scenario: 100 year

Return Event: 100 years
 Storm Event: Monmouth NOAA-D (8.94 in)

Infiltration

Infiltration Method (Computed)	No Infiltration
-----------------------------------	-----------------

Initial Conditions

Elevation (Water Surface, Initial)	46.50 ft
Volume (Initial)	0.000 ft ³
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	1.000 min

Elevation (ft)	Outflow (ft ³ /s)	Storage (ft ³)	Area (acres)	Infiltration (ft ³ /s)	Flow (Total) (ft ³ /s)	2S/t + O (ft ³ /s)
46.50	0.00	0.000	0.000	0.00	0.00	0.00
46.60	0.02	999.100	0.000	0.00	0.02	33.32
46.70	0.06	1,998.200	0.000	0.00	0.06	66.66
46.80	0.10	2,997.300	0.000	0.00	0.10	100.01
46.90	0.12	3,996.400	0.000	0.00	0.12	133.34
47.00	0.14	4,995.500	0.000	0.00	0.14	166.66
47.10	0.16	5,994.600	0.000	0.00	0.16	199.98
47.20	0.18	6,993.700	0.000	0.00	0.18	233.30
47.30	0.19	7,992.800	0.000	0.00	0.19	266.62
47.40	0.21	8,991.900	0.000	0.00	0.21	299.94
47.50	0.22	9,991.000	0.000	0.00	0.22	333.25
47.60	0.23	10,990.100	0.000	0.00	0.23	366.57
47.70	0.24	11,989.200	0.000	0.00	0.24	399.88
47.80	0.26	12,988.300	0.000	0.00	0.26	433.20
47.90	0.27	13,987.400	0.000	0.00	0.27	466.51
48.00	0.28	14,986.500	0.000	0.00	0.28	499.83
48.10	0.29	15,985.600	0.000	0.00	0.29	533.14
48.20	0.30	16,984.700	0.000	0.00	0.30	566.45
48.30	0.31	17,983.800	0.000	0.00	0.31	599.77
48.40	0.31	18,982.900	0.000	0.00	0.31	633.08
48.50	0.32	19,982.000	0.000	0.00	0.32	666.39
48.60	0.33	20,981.100	0.000	0.00	0.33	699.70
48.70	0.34	21,980.200	0.000	0.00	0.34	733.01
48.80	0.35	22,979.300	0.000	0.00	0.35	766.33
48.90	0.36	23,978.400	0.000	0.00	0.36	799.64
49.00	0.36	24,977.500	0.000	0.00	0.36	832.95
49.10	0.37	25,976.600	0.000	0.00	0.37	866.26
49.20	0.38	26,975.700	0.000	0.00	0.38	899.57
49.30	0.39	27,974.800	0.000	0.00	0.39	932.88
49.35	0.39	28,474.350	0.000	0.00	0.39	949.54

Subsection: Elevation-Volume-Flow Table (Pond)
Label: BASIN-2
Scenario: 100 year

Return Event: 100 years
Storm Event: Monmouth NOAA-D (8.94 in)

Elevation (ft)	Outflow (ft ³ /s)	Storage (ft ³)	Area (acres)	Infiltration (ft ³ /s)	Flow (Total) (ft ³ /s)	2S/t + O (ft ³ /s)
49.40	0.41	28,973.900	0.000	0.00	0.41	966.21
49.50	0.49	29,973.000	0.000	0.00	0.49	999.59

Subsection: Level Pool Pond Routing Summary
Label: BASIN-2 (IN)
Scenario: 2 year

Return Event: 2 years
Storm Event: Monmouth NOAA-D (3.38 in)

Infiltration

Infiltration Method (Computed)	No Infiltration
--------------------------------	-----------------

Initial Conditions

Elevation (Water Surface, Initial)	46.50 ft
Volume (Initial)	0.000 ft ³
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	1.000 min

Inflow/Outflow Hydrograph Summary

Flow (Peak In)	3.61 ft ³ /s	Time to Peak (Flow, In)	727.000 min
Flow (Peak Outlet)	0.19 ft ³ /s	Time to Peak (Flow, Outlet)	860.000 min

Elevation (Water Surface, Peak)	47.25 ft
Volume (Peak)	7,534.106 ft ³

Mass Balance (ft³)

Volume (Initial)	0.000 ft ³
Volume (Total Inflow)	12,671.000 ft ³
Volume (Total Infiltration)	0.000 ft ³
Volume (Total Outlet Outflow)	7,958.000 ft ³
Volume (Retained)	4,705.000 ft ³
Volume (Unrouted)	-8.000 ft ³
Error (Mass Balance)	0.1 %

Subsection: Level Pool Pond Routing Summary
Label: BASIN-2 (IN)
Scenario: 10 year

Return Event: 10 years
Storm Event: Monmouth NOAA-D (5.23 in)

Infiltration

Infiltration Method (Computed)	No Infiltration
-----------------------------------	-----------------

Initial Conditions

Elevation (Water Surface, Initial)	46.50 ft
Volume (Initial)	0.000 ft ³
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	1.000 min

Inflow/Outflow Hydrograph Summary

Flow (Peak In)	6.55 ft ³ /s	Time to Peak (Flow, In)	727.000 min
Flow (Peak Outlet)	0.26 ft ³ /s	Time to Peak (Flow, Outlet)	893.000 min

Elevation (Water Surface, Peak)	47.88 ft
Volume (Peak)	13,796.651 ft ³

Mass Balance (ft³)

Volume (Initial)	0.000 ft ³
Volume (Total Inflow)	22,364.000 ft ³
Volume (Total Infiltration)	0.000 ft ³
Volume (Total Outlet Outflow)	12,081.000 ft ³
Volume (Retained)	10,269.000 ft ³
Volume (Unrouted)	-13.000 ft ³
Error (Mass Balance)	0.1 %

Subsection: Level Pool Pond Routing Summary
Label: BASIN-2 (IN)
Scenario: 25 year

Return Event: 25 years
Storm Event: Monmouth NOAA-D (6.53 in)

Infiltration

Infiltration Method (Computed)	No Infiltration
-----------------------------------	-----------------

Initial Conditions

Elevation (Water Surface, Initial)	46.50 ft
Volume (Initial)	0.000 ft ³
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	1.000 min

Inflow/Outflow Hydrograph Summary

Flow (Peak In)	8.78 ft ³ /s	Time to Peak (Flow, In)	727.000 min
Flow (Peak Outlet)	0.31 ft ³ /s	Time to Peak (Flow, Outlet)	908.000 min

Elevation (Water Surface, Peak)	48.38 ft
Volume (Peak)	18,786.515 ft ³

Mass Balance (ft³)

Volume (Initial)	0.000 ft ³
Volume (Total Inflow)	29,719.000 ft ³
Volume (Total Infiltration)	0.000 ft ³
Volume (Total Outlet Outflow)	14,685.000 ft ³
Volume (Retained)	15,018.000 ft ³
Volume (Unrouted)	-17.000 ft ³
Error (Mass Balance)	0.1 %

Subsection: Level Pool Pond Routing Summary
Label: BASIN-2 (IN)
Scenario: 100 year

Return Event: 100 years
Storm Event: Monmouth NOAA-D (8.94 in)

Infiltration

Infiltration Method (Computed)	No Infiltration
-----------------------------------	-----------------

Initial Conditions

Elevation (Water Surface, Initial)	46.50 ft
Volume (Initial)	0.000 ft ³
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	1.000 min

Inflow/Outflow Hydrograph Summary

Flow (Peak In)	13.11 ft ³ /s	Time to Peak (Flow, In)	727.000 min
Flow (Peak Outlet)	0.41 ft ³ /s	Time to Peak (Flow, Outlet)	951.000 min

Elevation (Water Surface, Peak)	49.39 ft
Volume (Peak)	28,906.728 ft ³

Mass Balance (ft³)

Volume (Initial)	0.000 ft ³
Volume (Total Inflow)	44,072.000 ft ³
Volume (Total Infiltration)	0.000 ft ³
Volume (Total Outlet Outflow)	19,152.000 ft ³
Volume (Retained)	24,899.000 ft ³
Volume (Unrouted)	-22.000 ft ³
Error (Mass Balance)	0.0 %

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APPENDIX E
Water Quality Control Calculations

Project Summary

Title Basin #1 Water
Quality

Engineer Bahram Farzaneh

Company French and
Parrello Associates

Date 6/7/2021

Notes

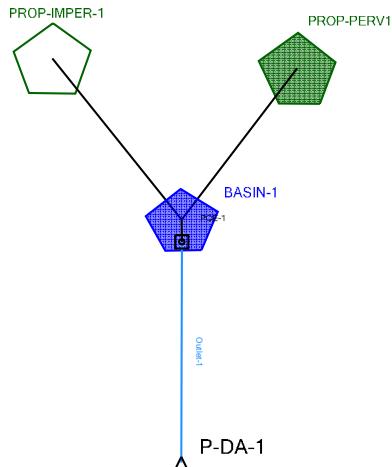


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Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
PROP-IMPER-1	NJWQ	1	5,558.000	66.000	4.21
PROP-PERV1	NJWQ	1	0.000	0.000	0.00

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
P-DA-1	NJWQ	1	5,442.000	96.000	0.49

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
BASIN-1 (IN)	NJWQ	1	5,558.000	66.000	4.21	(N/A)	(N/A)
BASIN-1 (OUT)	NJWQ	1	5,442.000	96.000	0.49	43.11	4,146.000

Subsection: Unit Hydrograph Summary
Label: PROP-IMPER-1
Scenario: NJWQ

Return Event: 1 years
Storm Event: NJWQ (1.3 in)

Storm Event	NJWQ (1.3 in)
Return Event	1 years
Duration	1,440.000 min
Depth	1.25 in
Time of Concentration (Composite)	7.000 min
Area (User Defined)	1.480 acres
<hr/>	
Computational Time Increment	0.933 min
Time to Peak (Computed)	66.267 min
Flow (Peak, Computed)	4.22 ft ³ /s
Output Increment	0.600 min
Time to Flow (Peak Interpolated Output)	66.000 min
Flow (Peak Interpolated Output)	4.21 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	1.480 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.03 in
Runoff Volume (Pervious)	5,558.136 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	5,558.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	

Time of Concentration (Composite)	7.000 min
Computational Time Increment	0.933 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	14.37 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: PROP-IMPER-1
Scenario: NJWQ

Return Event: 1 years
Storm Event: NJWQ (1.3 in)

SCS Unit Hydrograph Parameters

Unit peak time, Tp	4.667 min
Unit receding limb, Tr	18.667 min
Total unit time, Tb	23.333 min

Subsection: Unit Hydrograph Summary
Label: PROP-PERV1
Scenario: NJWQ

Return Event: 1 years
Storm Event: NJWQ (1.3 in)

Storm Event	NJWQ (1.3 in)
Return Event	1 years
Duration	1,440.000 min
Depth	1.25 in
Time of Concentration (Composite)	7.000 min
Area (User Defined)	0.930 acres
<hr/>	
Computational Time Increment	0.933 min
Time to Peak (Computed)	0.000 min
Flow (Peak, Computed)	0.00 ft ³ /s
Output Increment	0.600 min
Time to Flow (Peak Interpolated Output)	0.000 min
Flow (Peak Interpolated Output)	0.00 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	0.930 acres
Maximum Retention (Pervious)	6.39 in
Maximum Retention (Pervious, 20 percent)	1.28 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.00 in
Runoff Volume (Pervious)	0.000 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	7.000 min
Computational Time Increment	0.933 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	9.03 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: PROP-PERV1
Scenario: NJWQ

Return Event: 1 years
Storm Event: NJWQ (1.3 in)

SCS Unit Hydrograph Parameters

Unit peak time, Tp	4.667 min
Unit receding limb, Tr	18.667 min
Total unit time, Tb	23.333 min

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PROP-IMPER-1 (Unit Hydrograph Summary, 1 years (NJWQ))...3, 4

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Project Summary

Title Basin #2 Water
Quality

Engineer Bahram Farzaneh

Company French and
Parrello Associates

Date 6/7/2021

Notes

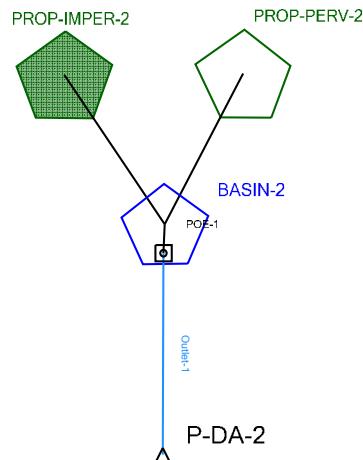


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PROP-PERV-2	
Unit Hydrograph Summary, 1 years (NJWQ)	5

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
PROP-IMPER-2	NJWQ	1	3,606.000	65.400	2.87
PROP-PERV-2	NJWQ	1	0.000	0.000	0.00

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)
P-DA-2	NJWQ	1	2,996.000	113.400	0.11

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (min)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
BASIN-2 (IN)	NJWQ	1	3,606.000	65.400	2.87	(N/A)	(N/A)
BASIN-2 (OUT)	NJWQ	1	2,996.000	113.400	0.11	46.83	3,259.000

Subsection: Unit Hydrograph Summary
Label: PROP-IMPER-2
Scenario: NJWQ

Return Event: 1 years
Storm Event: NJWQ (1.3 in)

Storm Event	NJWQ (1.3 in)
Return Event	1 years
Duration	1,440.000 min
Depth	1.25 in
Time of Concentration (Composite)	5.000 min
Area (User Defined)	0.960 acres
<hr/>	
Computational Time Increment	0.667 min
Time to Peak (Computed)	65.333 min
Flow (Peak, Computed)	2.87 ft ³ /s
Output Increment	0.600 min
Time to Flow (Peak Interpolated Output)	65.400 min
Flow (Peak Interpolated Output)	2.87 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.960 acres
Maximum Retention (Pervious)	0.20 in
Maximum Retention (Pervious, 20 percent)	0.04 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.03 in
Runoff Volume (Pervious)	3,605.278 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	3,606.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	

Time of Concentration (Composite)	5.000 min
Computational Time Increment	0.667 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	13.05 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: PROP-IMPER-2
Scenario: NJWQ

Return Event: 1 years
Storm Event: NJWQ (1.3 in)

SCS Unit Hydrograph Parameters

Unit peak time, Tp	3.333 min
Unit receding limb, Tr	13.333 min
Total unit time, Tb	16.667 min

Subsection: Unit Hydrograph Summary
Label: PROP-PERV-2
Scenario: NJWQ

Return Event: 1 years
Storm Event: NJWQ (1.3 in)

Storm Event	NJWQ (1.3 in)
Return Event	1 years
Duration	1,440.000 min
Depth	1.25 in
Time of Concentration (Composite)	5.000 min
Area (User Defined)	0.910 acres
<hr/>	
Computational Time Increment	0.667 min
Time to Peak (Computed)	0.000 min
Flow (Peak, Computed)	0.00 ft ³ /s
Output Increment	0.600 min
Time to Flow (Peak Interpolated Output)	0.000 min
Flow (Peak Interpolated Output)	0.00 ft ³ /s
<hr/>	
Drainage Area	
SCS CN (Composite)	61.000
Area (User Defined)	0.910 acres
Maximum Retention (Pervious)	6.39 in
Maximum Retention (Pervious, 20 percent)	1.28 in
<hr/>	
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.00 in
Runoff Volume (Pervious)	0.000 ft ³
<hr/>	
Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.000 ft ³
<hr/>	
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	5.000 min
Computational Time Increment	0.667 min
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	12.37 ft ³ /s

Subsection: Unit Hydrograph Summary
Label: PROP-PERV-2
Scenario: NJWQ

Return Event: 1 years
Storm Event: NJWQ (1.3 in)

SCS Unit Hydrograph Parameters

Unit peak time, Tp	3.333 min
Unit receding limb, Tr	13.333 min
Total unit time, Tb	16.667 min

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M

Master Network Summary...2

P

PROP-IMPER-2 (Unit Hydrograph Summary, 1 years (NJWQ))...3, 4

PROP-PERV-2 (Unit Hydrograph Summary, 1 years (NJWQ))...5, 6

APPENDIX F
Groundwater Recharge Calculations

New Jersey
Groundwater
Recharge
Spreadsheet
Version 2.0
November 2003

Annual Groundwater Recharge Analysis (based on GSR-32)

Project Name: 91 Rumson Road			
Description: 15052.003 - BASIN 1			
Analysis Date: 01/20/21			
Post-Developed Conditions			
Land Segment	Area (acres)	TR-55 Land Cover	Soil
1	1.03	Woods	Freehold
2	1.06	Impervious areas	Freehold
3	2.19	Open space	Freehold
4	0		
5	0		
6	0		
7	0		
8	0		
9	0		
10	0		
11	0		
12	0		
13	0		
14	0		
15	0		
Total =	4.3	Total Annual Recharge (in)	Total = 4.3
		11.8	183,602
			Annual Recharge Requirements Calculation ↓
			104,172
			% of Pre-Developed Annual Recharge to Preserve = 100%
			Total Impenetrable Area (sq.ft) 106,286
Post-Development Annual Recharge Deficit= 79,430 (cubic feet)			
Recharge Efficiency Parameters Calculations (area averages\$)			
RWIC= #N/A	(in)	DRWC= #N/A	
ERWC = #N/A	(in)	EDRWC= #N/A	(in)

Procedure to fill the Pre-Development and Post-Development Conditions Tables

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

Project Name	Description 15052.003 - BASIN 1			Analysis Date	BMP or LID Type		
Recharge BMP Input Parameters				Root Zone Water capacity Calculated Parameters			
Parameter	Symbol	Value	Unit	Parameter	Symbol	Value	Unit
BMP Area	ABMP	6954.0	sq.ft	Empty Portion of RWC under Post-D Natural Recharge	ERWC	1.29	in
BMP Effective Depth, this is the design variable	dBMP	2.2	in	ERWC Modified to consider dEXC	EDRWC	0.00	in
Upper level of the BMP surface (negative if above ground)	dBMpU	60.0	in	Empty Portion of RWC under Infiltr. BMP	RERWC	0.00	in
Depth of lower surface of BMP, must be>=dBMPu	dEXC	96.0	in				
Post-development Land Segment Location of BMP, Input zero if Location is distributed or undetermined	SegBMP	3	unitless				
BMP Calculated Size Parameters				CALCULATION CHECK MESSAGES			
Post-D Deficit Recharge (or desired recharge volume)	Vdef	79,430	cu.ft	ABMP/Aimp	Ratio	0.11	unitless
Post-D Impervious Area (or target Impervious Area)	Aimp	64,469	sq.ft	BMP Volume	VBMP	1,254	cu.ft
System Performance Calculated Parameters				BMP Location-->	OK		
Root Zone Water Capacity	RWC	5.74	in	Annual BMP Recharge Volume		79,430	cu.ft
RWC Modified to consider dEXC	DRWC	0.00	in	Avg BMP Recharge Efficiency		100.0%	Represents % Infiltration Recharged
Climatic Factor	C-factor	1.55	no units	%Rainfall became Runoff		78.2%	OTHER NOTES
Average Annual P	Pavg	47.4	in	%Runoff Infiltrated		39.9%	Notes: Design is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensitive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.
Recharge Requirement over Imp. Area	dr	9.0	in	%Runoff Recharged		24.2%	
				%Rainfall Recharged		18.9%	
How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP. To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration click the "Default Vdef & Aimp" button.							

2.2 inches / 0.4 void ratio = 5.5 inches required < 24 inches clean stone provided for Basin #1

New Jersey
Groundwater
Recharge
Spreadsheet
Version 2.0
November 2003

Annual Groundwater Recharge Analysis (based on GSR-32)

Project Name: 91 Rumson Road			
Description: 15052.003 - BASIN 2			
Analysis Date: 01/20/21			
Post-Developed Conditions			
Land Segment	Area (acres)	TR-55 Land Cover	Soil
1	1.03	Woods	Freehold
2	1.06	Impervious areas	Freehold
3	2.19	Open space	Freehold
4	0		
5	0		
6	0		
7	0		
8	0		
9	0		
10	0		
11	0		
12	0		
13	0		
14	0		
15	0		
Total =	4.3	Total Annual Recharge (in)	Total = 4.3
		11.8	183,602
			Annual Recharge Requirements Calculation ↓
			6.7
			Total Annual Recharge (in)
			104,172
		% of Pre-Developed Annual Recharge to Preserve =	100%
			Total Impenetrable Area (sq ft)
			106,286
Post-Development Annual Recharge Deficit=			
Recharge Efficiency Parameters Calculations (area averages\$)			
RWIC= #N/A	(in)	DRWC= #N/A	
ERWC = #N/A	(in)	EDRWC= #N/A	(in)

Procedure to fill the Pre-Development and Post-Development Conditions Tables

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

% of Pre-Developed Annual Recharge to Preserve =

100%

Total Impenetrable Area (sq ft)

106,286

Post-Development Annual Recharge Deficit=

79,430 (cubic feet)

Recharge Efficiency Parameters Calculations (area averages\$)

DRWC= #N/A

EDRWC= #N/A

Project Name		<u>Description</u>		<u>Analysis Date</u>	<u>BMP or LID Type</u>
91 Rumson Road		15052.003 - BASIN 2		01/20/21	
Recharge BMP Input Parameters					
Parameter	Symbol	Value	Unit	Root Zone Water capacity Calculated Parameters	
BMP Area	ABMP	10304.0	sq.ft	Empty Portion of RWC under Post-D Natural Recharge	ERWC 1.29 in
BMP Effective Depth, this is the design variable	dBMP	1.8	in	ERWC Modified to consider dEXC	EDRWC 0.00 in
Upper level of the BMP surface (negative if above ground)	dBMpU	66.0	in	Empty Portion of RWC under Infiltr. BMP	RERWC 0.00 in
Depth of lower surface of BMP, must be>=dBMPu	dEXC	102.0	in		
Post-development Land Segment Location of BMP, Input Zero if Location is distributed or undetermined	SegBMP	3	unitless		
BMP Calculated Size Parameters					
Post-D Deficit Recharge (or desired recharge volume)	Vdef	79,430	cu.ft	ABMP/Aimp	Ratio 0.25 unitless
Post-D Impervious Area (or target Impervious Area)	Aimp	41,818	sq.ft	BMP Volume	VBMP 1,587 cu.ft
Root Zone Water Capacity	RWC	5.74	in	Annual BMP Recharge Volume	79,430 cu.ft
RWC Modified to consider dEXC	DRWC	0.00	in	Avg BMP Recharge Efficiency	100.0% Represents % Infiltration Recharged
Climatic Factor	C-factor	1.55	no units	%Rainfall became Runoff	78.2% %
Average Annual P	Pavg	47.4	in	%Runoff Infiltrated	61.5% %
Recharge Requirement over Imp. Area	dr	9.0	in	%Runoff Recharged	24.2% %
				%Rainfall Recharged	18.9% %
System Performance Calculated Parameters					
					OTHER NOTES
					Volume Balance-> OK
					dBMP Check-> OK
					dEXC Check--> OK
					BMP Location--> OK
CALCULATION CHECK MESSAGES					
					Post-D Deficit Recharge volume= deficit volume. The portion of BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensitive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "Impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.
					How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP. To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp the "Default Vdef & Aimp" button.

1.8 inches / 0.4 void ratio = 4.5 inches required < 11 inches clean stone provided for Basin #2

APPENDIX G
Low Impact Development Compliance

New Jersey Stormwater Best Management Practices Manual

February 2004

A P P E N D I X A

Low Impact Development Checklist

A checklist for identifying nonstructural stormwater management strategies incorporated into proposed land development

According to the NJDEP Stormwater Management Rules at N.J.A.C. 7:8, the groundwater recharge, stormwater quality, and stormwater quantity standards established by the Rules for major land development projects must be met by incorporating nine specific nonstructural stormwater management strategies into the project's design to the maximum extent practicable.

To accomplish this, the Rules require an applicant seeking land development approval from a regulatory board or agency to identify those nonstructural strategies that have been incorporated into the project's design. In addition, if an applicant contends that it is not feasible to incorporate any of the specific strategies into the project's design, particularly for engineering, environmental, or safety reasons, the Rules further require that the applicant provide a basis for that contention.

This checklist has been prepared to assist applicants, site designers, and regulatory boards and agencies in ensuring that the nonstructural stormwater management requirements of the Rules are met. It provides an applicant with a means to identify both the nonstructural strategies incorporated into the development's design and the specific low impact development BMPs (LID-BMPs) that have been used to do so. It can also help an applicant explain the engineering, environmental, and/or safety reasons that a specific nonstructural strategy could not be incorporated into the development's design.

The checklist can also assist municipalities and other land development review agencies in the development of specific requirements for both nonstructural strategies and LID-BMPs in zoning and/or land use ordinances and regulations. As such, where requirements consistent with the Rules have been adopted, they may supersede this checklist.

Finally, the checklist can be used during a pre-design meeting between an applicant and pertinent review personnel to discuss local nonstructural strategies and LID-BMPs requirements in order to optimize the development's nonstructural stormwater management design.

Since this checklist is intended to promote the use of nonstructural stormwater management strategies and provide guidance in their incorporation in land development projects, municipalities are permitted to revise it as necessary to meet the goals and objectives of their specific stormwater management program and plan within the limits of N.J.A.C. 7:8.

Low Impact Development Checklist

A checklist for identifying nonstructural stormwater management strategies incorporated into proposed land development

Municipality: Rumson

County: Monmouth Date: 1/29/2021

Review board or agency: Borough of Rumson

Proposed land development name: 132 Bingham Ave

Lot(s): 5 Block(s): 94

Project or application number: _____

Applicant's name: Yellow Brook Property Co., LLC

Applicant's address: 247 Bridge Ave., Suite 5

Red Bank, NJ 07701

Telephone: 732-842-1580 Fax: _____

Email address: _____

Designer's name: French & Parrello Associates - Brian R. Decina, PE

Designer's address: 1800 Route 34, Suite 101

Wall, NJ 07719

Telephone: 732-312-9800 Fax: _____

Email address: brian.decina@fpaengineers.com

Part 1: Description of Nonstructural Approach to Site Design

In narrative form, provide an overall description of the nonstructural stormwater management approach and strategies incorporated into the proposed site's design. Attach additional pages as necessary. Details of each nonstructural strategy are provided in Part 3 below.

Open channels are used to convey stormwater runoff in lawn areas until

it is collected into the stormwater management system.

Part 2: Review of Local Stormwater Management Regulations

Title and date of stormwater management regulations used in development design:

N.J.A.C. 7:8 - Amended June 20, 2016

Do regulations include nonstructural requirements? Yes: _____ No: **X** _____

If yes, briefly describe: _____

List LID-BMPs prohibited by local regulations: _____

Pre-design meeting held? Yes: _____ Date: _____ No: **X** _____

Meeting held with: _____

Pre-design site walk held? Yes: _____ Date: _____ No: **X** _____

Site walk held with: _____

Other agencies with stormwater review jurisdiction:

Name: **Freehold Soil Conservation District** _____

Required approval: **Yes** _____

Name: _____

Required approval: _____

Name: _____

Required approval: _____

Part 3: Nonstructural Strategies and LID-BMPs in Design

3.1 Vegetation and Landscaping

Effective management of both existing and proposed site vegetation can reduce a development's adverse impacts on groundwater recharges and runoff quality and quantity. This section of the checklist helps identify the vegetation and landscaping strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to help maintain existing recharge rates and/or minimize or prevent increases in runoff quantity and pollutant loading.

A. Has an inventory of existing site vegetation been performed? Yes: No: _____

If yes, was this inventory a factor in the site's layout and design? Yes: No: _____

B. Does the site design utilize any of the following nonstructural LID-BMPs?

Preservation of natural areas? Yes: No: _____ If yes, specify % of site: **15**

Native ground cover? Yes: No: _____ If yes, specify % of site: **15**

Vegetated buffers? Yes: No: _____ If yes, specify % of site: **30**

C. Do the land development regulations require these nonstructural LID-BMPs?

Preservation of natural areas? Yes: _____ No: If yes, specify % of site: _____

Native ground cover? Yes: _____ No: If yes, specify % of site: _____

Vegetated buffers? Yes: _____ No: If yes, specify % of site: _____

D. If vegetated filter strips or buffers are utilized, specify their functions:

Reduce runoff volume increases through lower runoff coefficient: Yes: No: _____

Reduce runoff pollutant loads through runoff treatment: Yes: _____ No:

Maintain groundwater recharge by preserving natural areas: Yes: _____ No:

3.2 Minimize Land Disturbance

Minimizing land disturbance is a nonstructural LID-BMP that can be applied during both the development's construction and post-construction phases. This section of the checklist helps identify those land disturbance strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to minimize land disturbance and the resultant change in the site's hydrologic character.

A. Have inventories of existing site soils and slopes been performed? Yes: _____ No: X

If yes, were these inventories factors in the site's layout and design? Yes: _____ No: X

B. Does the development's design utilize any of the following nonstructural LID-BMPs?

Restrict permanent site disturbance by land owners? Yes: _____ No: X

If yes, how: _____

Restrict temporary site disturbance during construction? Yes: _____ No: X

If yes, how: _____

Consider soils and slopes in selecting disturbance limits? Yes: _____ No: X

If yes, how: _____

C. Specify percentage of site to be cleared: **40** Regraded: **40**

D. Specify percentage of cleared areas done so for buildings: **15**

For driveways and parking: **15** For roadways: **10**

E. What design criteria and/or site changes would be required to reduce the percentages in C and D above?

None

F. Specify site's hydrologic soil group (HSG) percentages:

HSG A: _____ HSG B: **X** HSG C: _____ HSG D: _____

G. Specify percentage of each HSG that will be permanently disturbed:

HSG A: _____ HSG B: **100** HSG C: _____ HSG D: _____

H. Locating site disturbance within areas with less permeable soils (HSG C and D) and minimizing disturbance within areas with greater permeable soils (HSG A and B) can help maintain groundwater recharge rates and reduce runoff volume increases. In light of the HSG percentages in F and G above, what other practical measures if any can be taken to achieve this?

Entire site is HSG B

I. Does the site include Karst topography?

Yes: _____ No: **X**

If yes, discuss measures taken to limit Karst impacts:

3.3 Impervious Area Management

New impervious surfaces at a development site can have the greatest adverse effect on groundwater recharge and stormwater quality and quantity. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into a proposed development's design to comprehensively manage the extent and impacts of new impervious surfaces.

A. Specify impervious cover at site: Existing: 25% Proposed: 43%

B. Specify maximum site impervious coverage allowed by regulations: 55%

C. Compare proposed street cartway widths with those required by regulations:

Type of Street	Proposed Cartway Width (feet)	Required Cartway Width (feet)
Residential access – low intensity	<u>24 ft.</u>	<u>24 ft.</u>
Residential access – medium intensity		
Residential access – high intensity with parking		
Residential access – high intensity without parking		
Neighborhood		
Minor collector – low intensity without parking		
Minor collector – with one parking lane		
Minor collector – with two parking lanes		
Minor collector – without parking		
Major collector		

D. Compare proposed parking space dimensions with those required by regulations:

Proposed: 11' x 22' Regulations: 11' x 22'

E. Compare proposed number of parking spaces with those required by regulations:

Proposed: _____ Regulations: _____

F. Specify percentage of total site impervious cover created by buildings: **15%**

By driveways and parking: 15% By roadways: 10%

G. What design criteria and/or site changes would be required to reduce the percentages in F above?

None

H. Specify percentage of total impervious area that will be unconnected:

Total site: 0 Buildings: 0 Driveways and parking: 0 Roads: 0

I. Specify percentage of total impervious area that will be porous:

Total site: 0 Buildings: 0 Driveways and parking: 0 Roads: 0

J. Specify percentage of total building roof area that will be vegetated: 0

K. Specify percentage of total parking area located beneath buildings: 0

L. Specify percentage of total parking located within multi-level parking deck: 0

3.4 Time of Concentration Modifications

Decreasing a site's time of concentration (Tc) can lead directly to increased site runoff rates which, in turn, can create new and/or aggravate existing erosion and flooding problems downstream. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to effectively minimize such Tc decreases.

When reviewing Tc modification strategies, it is important to remember that a drainage area's Tc should reflect the general conditions throughout the area. As a result, Tc modifications must generally be applied throughout a drainage area, not just along a specific Tc route.

A. Specify percentage of site's total stormwater conveyance system length that will be:

Storm sewer: 80 Vegetated swale: 10 Natural channel: _____

Stormwater management facility: 10 Other: _____

Note: the total length of the stormwater conveyance system should be measured from the site's downstream property line to the downstream limit of sheet flow at the system's headwaters.

B. What design criteria and/or site changes would be required to reduce the storm sewer percentages and increase the vegetated swale and natural channel percentages in A above?

None

C. In conveyance system subareas that have overland or sheet flow over impervious surfaces or turf grass, what practical and effective site changes can be made to:

Decrease overland flow slope: None

Increase overland flow roughness: None

3.5 Preventative Source Controls

The most effective way to address water quality concerns is by pollution prevention. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to reduce the exposure of pollutants to prevent their release into the stormwater runoff.

A. Trash Receptacles

Specify the number of trash receptacles provided: TBD

Specify the spacing between the trash receptacles: TBD

Compare trash receptacles proposed with those required by regulations:

Proposed: TBD Regulations: 0

B. Pet Waste Stations

Specify the number of pet waste stations provided: 0

Specify the spacing between the pet waste stations: _____

Compare pet waste stations proposed with those required by regulations:

Proposed: 0 Regulations: 0

C. Inlets, Trash Racks, and Other Devices that Prevent Discharge of Large Trash and Debris

Specify percentage of total inlets that comply with the NJPDES storm drain inlet criteria: 100

D. Maintenance

Specify the frequency of the following maintenance activities:

Street sweeping: Proposed: TBD Regulations: None

Litter collection: Proposed: TBD Regulations: None

Identify other stormwater management measures on the site that prevent discharge of large trash and debris:

Outlet Structure trash rack

E. Prevention and Containment of Spills

Identify locations where pollutants are located on the site, and the features that prevent these pollutants from being exposed to stormwater runoff:

Pollutant: **None** Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: **N/A** Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: **N/A** Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: **N/A** Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: **N/A** Location: _____

Part 4: Compliance with Nonstructural Requirements of NJDEP Stormwater Management Rules

1. Based upon the checklist responses above, indicate which nonstructural strategies have been incorporated into the proposed development's design in accordance with N.J.A.C. 7:8-5.3(b):

No.	Nonstructural Strategy	Yes	No
1.	Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.	X	
2.	Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.	X	
3.	Maximize the protection of natural drainage features and vegetation.	X	
4.	Minimize the decrease in the pre-construction time of concentration.	X	
5.	Minimize land disturbance including clearing and grading.	X	
6.	Minimize soil compaction.	X	
7.	Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides.	X	
8.	Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas.	X	
9.	Provide preventative source controls.	X	

2. For those strategies that have not been incorporated into the proposed development's design, provide engineering, environmental, and/or safety reasons. Attached additional pages as necessary.

APPENDIX H
Drainage Area Maps
